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Health Building Note 27

Intensive therapy unit

NHS Estates
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Health Building Note 27

Intensive therapy unit

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About this publication

The Health Building Note series is intended to give advice on the briefing and design implications of Department of Health policy.

These Notes are prepared in consultation with representatives of the National Health Service and appropriate professional bodies.

Health Building Notes are aimed at multi-disciplinary teams engaged in:

- designing new buildings;
- adapting or extending existing buildings.

Throughout the series, particular attention is paid to the relationship between the design of a given department and its subsequent management. Since this equation will have important implications for capital and running costs, alternative solutions are sometimes proposed. The intention is to give the reader informed guidance on which to base design decisions.

Health Building Note 27

HBN 27 focuses on District General Hospital accommodation requirements for an intensive therapy unit with dedicated support facilities.

This Note recommends and assumes that medical, nursing and other specialist staff will be closely involved from the earliest stages of any project.

Acknowledgements

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Contents

Preface
Acknowledgements
1. Scope of Health Building Note 27 *page 3*
1.1 Introduction
1.3 Inclusions
1.4 Exclusions
1.7 Capricode
1.8 Cost allowances
1.9 Equipment

2. General service considerations *page 4*
2.1 Purpose and objectives
2.3 Service planning issues
2.7 Future service trends
2.8 Scale of provision
2.9 Functional unit
2.10 User requirements
2.10 Patients
2.11 Staff
2.12 Visitors
2.13 Clinical teaching
2.14 Control of infection
2.15 Health and safety
2.16 Reporting/handover
2.17 Blood gas analysis/other pathology tests
2.18 Whole Hospital policies
2.18 Catering
2.21 Domestic services
2.22 Supplies, storage and disposal
2.27 Organisation
2.33 Disposal
2.37 Information handling
2.39 Staff changing

3. General functional and design requirements *page 9*
3.2 Location and departmental relationships
3.6 Layout and planning relationships
3.8 Communications
3.10 Telephones
3.12 Security/control of access
3.14 Fire safety
3.19 Internal environmental considerations
3.20 Natural and artificial lighting
3.22 Noise and sound attenuation
3.24 Ventilation
3.27 Heating
3.28 Smoking
3.29 Finishes
3.30 Floors
3.34 Walls
3.36 Ceilings
3.37 Doors and frames
3.38 Windows
3.40 Maintenance and cleaning
3.41 Signposting

4. Specific functional and design requirements *page 15*
4.1 Introduction
4.3 Functional relationships
4.4 Staff base/patient bed areas
4.5 Patient bed areas/utilities and storage equipment
4.6 Patient bed areas/staff areas
4.7 Bed space/bed space
4.8 Observation

Description of accommodation page 15

4.9 Entrance/waiting area
4.10 Staff base
4.11 Bed areas
4.14 Single-bed rooms and gowning lobbies
4.18 Multi-bed area
4.21 Bedside storage
4.23 Clean utility
4.24 Dirty utility
4.29 Disposal hold
4.32 Storage
4.32 Bulk supplies store
4.33 Linen storage
4.34 Mobile X-ray equipment bay
4.35 Furniture store
4.36 Clinical equipment store
4.37 Equipment service room
4.38 Laboratory
4.39 Staff changing
4.41 Staff rest room/pantry
4.43 Patients' pantry
4.44 On-call facilities
4.45 Facilities for relatives
4.47 Office accommodation
4.48 Seminar room
4.49 Cleaners' room
4.50 Switchcupboard
4.52 Assisted bathroom/WC

5. Other general functional and design requirements *page 20*
5.2 Statutory and other requirements
5.4 Works Guidance Index
5.5 Security
5.6 Upgrading or adaptation of existing buildings
5.14 Component Data
5.15 Provision for automatic data processing
5.18 Disabled people

6. Engineering services *page 22*
6.1 Introduction
6.3 Model specifications
6.4 Economy
6.9 Maximum demands
6.10 Space for plant and services
6.14 Access to control and isolation devices
6.15 Activity Data
6.16 Safety
6.17 Fire precautions
6.19 Noise
6.21 Engineering commissioning
6.22 Location of electrical and medical gas outlets

Mechanical services page 24

6.23 Heating
6.28 Ventilation
6.28 General
6.36 Multi-bed area
6.37 Single-bed rooms
6.41 Controls
6.43 Hot, cold and drinking water services
6.46 Dialysis
6.50 Piped medical gases

Electrical services page 26

6.51 General scope
6.53 Electrical installation
6.54 Electrical interference
6.56 Lighting
6.66 Controlled Drugs cupboard
6.68 Socket-outlets and power connections
6.74 Socket-outlets for minor scheduled servicing of medical equipment
6.77 Emergency electrical supplies
6.80 Entrance door security systems
6.82 Staff/staff call systems
6.83 Staff location and emergency systems
6.84 Telephone wiring
6.88 Wireways
6.88 Data links
6.89 Physiological monitoring equipment
6.90 Electric clocks
6.91 Radio and television
6.92 Lightning protection

Internal drainage page 28

6.93 General scope
6.94 Design parameters
6.97 Operational considerations

7. Cost information *page 31*
7.1 Introduction
7.2 Works cost
7.4 Functional unit
7.5 Essential Complementary Accommodation
7.6 Optional Accommodation and Services
7.7 Dimensions and areas
7.10 Circulation
7.11 Communications
7.12 Engineering services
7.16 Equipment

8. Activity Data *page 35*

Appendix 1: Critical dimensions *page 37*

Appendix 2: Bed space equipment and service requirements *page 49*

Bibliography *page 50*

Alphabetical index *page 51*

Other publications in this series *page 52*

About NHS Estates *page 53*

1.0 Scope of Health Building Note 27

Introduction

1.1 This edition of Health Building Note (HBN) 27 provides guidance on the planning and design of intensive therapy units (ITUs) which form part of a District General Hospital (DGH). It replaces Hospital Building Note 27, Intensive Therapy Unit, published in 1970 and revised in 1974.

1.2 This Note reflects current thinking on the future role of ITUs. It is intended to facilitate good management and achieve cost effective running costs. Care has been taken to ensure that the guidance and recommendations for this accommodation are as economical as possible without detriment to clinical standards.

Inclusions

1.3 This guidance relates to "stand-alone" ITUs for adults and children, with dedicated support facilities.

Specific considerations, such as purpose and objectives, are covered in Chapter 2.

Exclusions

1.4 This Note does not contain guidance on the planning and design of specialist ITUs such as:

- ITU teaching hospitals;
- coronary care units;
- neurosurgical units;
- cardiothoracic unit;
- paediatric ITU;
- neonatal unit;
- burns unit;
- renal unit.

However, the Note may be useful to those providing such services.

1.5 Patients requiring high security isolation (for example, those with Lassa fever, rabies, Marburg disease, viral haemorrhagic fever) are generally admitted to specialised isolation facilities, either in the same hospital or elsewhere.

1.6 High dependency patients do not require the services and facilities provided in an ITU such as the intensity of nursing input and specialist equipment, and are more appropriately cared for in acute wards (see HBN 4 – 'Adult Acute Wards').

Capricode

1.7 Capricode is the Department of Health mandatory procedural framework governing the inception, planning, processing and control of individual health building schemes. The aim is to promote a consistent and streamlined approach to capital development that achieves best use of resources through the selection and construction of relevant and cost effective schemes that open on time and within budget. It identifies the main activities and provides a framework for delegation with effective management and the proper accounting for expenditure and performance. (See 'Capricode Health Building Procedures' issued with HN (86)32 – in Wales, WHC(86)62.)

Cost allowances

1.8 The NHS is notified separately of the Departmental Cost Allowance for this Note.

Equipment

1.9 Equipment relating to this Note is categorised into three groups:

Group 1: items (including engineering terminal outlets) supplied and fixed within the terms of the building contract;

Group 2: items which have space and/or building construction and/or engineering service requirements and are fixed within the terms of the building contract but supplied under arrangements separate from the building contract;

Group 3: as Group 2 but supplied and fixed (or placed in position) under arrangements separate from the building contract.

The Equipment Cost Allowance Guide (ECAG) specifies a budget cost for the functional unit for Groups 2 and 3.

2.0 General service considerations

Purpose and objectives

2.1 An intensive therapy unit (ITU) provides a service to patients, requiring intensive medical and nursing care, and access to life-support systems.

2.2 Once their conditions have stabilised and they no longer require life-support, patients will be transferred to an acute ward or to other specialist units for further specialised treatment.

Service planning issues

2.3 A District General Hospital with a range of medical and surgical specialties is the appropriate setting for an ITU, which should be provided as a self-contained unit. ITUs should not be provided in community hospitals.

2.4 The conditions for which patients are admitted, and the numbers of patients referred to an ITU from other hospital departments, varies considerably between ITUs. These factors need to be taken into account when estimating scale of provision required. It is vital that a clearly defined operational policy is prepared for each individual unit so that good management practices can be used.

2.5 The admissions policy for an ITU will be influenced, to some extent, by the availability locally of other specialist intensive care units. Only patients requiring the specialist services of an intensive therapy unit should be admitted to an ITU. Patients with burns may be admitted to an ITU if, for example, they require artificial ventilation but may be transferred to the appropriate specialist unit when practicable.

2.6 A variety of factors affect demand on an ITU. These include the range of services offered by the hospital, fluctuations in theatre workload, seasonal variations due to the adverse effects of weather, and locational factors such as proximity to motorways, major roads and airports, and seaside and other locations which attract influxes of seasonal visitors. Account will also need to be taken of regional disaster planning.

Future service trends

2.7 It is anticipated that there will be an increasing demand for intensive therapy services in the future because of improvements in clinical management, case selection and technological advances.

Scale of provision

2.8 The total number of in-patients to be treated per year in an ITU should be estimated on the basis of local workload patterns, taking account of the following:

a. admissions policy;

b. availability of other specialist units;

c. number and type of acute beds, numbers of theatres and surgical specialties served and annual workload of the accident and emergency department;

d. locational factors likely to affect demand (see paragraph 2.6);

e. bed occupancy and length of stay assumptions (the assumptions in this guidance are 65% bed occupancy and an average length of stay up to 48 hours).

Functional unit

2.9 The functional unit for an ITU is the "bed". Guidance in this Note covers ITUs with 6-8 beds but the majority of support facilities are sufficient for up to 10 beds.

User requirements

Patients

2.10 All patients require most or all of the following:

a. a bed space for treatment, multi-parameter monitoring and life-support systems;

b. access to medical gases and electrical outlets;

c. access to more specialised equipment such as haemodialysis machines;

d. visual privacy, particularly when receiving treatment;

e. awareness of daylight and outside views as an aid to orientation;

f. facilities for relatives and visitors.

Staff

2.11 Medical, nursing and paramedical staff require:

a. a design which facilitates observation of patients;

b. a design which facilitates effective deployment of nursing staff;

c. sufficient space around each bed to provide easy all-round access to the patient, equipment, medical gas supplies and clinical hand-washing facilities;

d. a lighting level sufficient for both patient examination and observation;

e. a means of summoning assistance from other staff;

f. storage for supplies and equipment within easy access of bed areas;

g. technical support services for urgent pathology tests and radiology procedures;

h. space and privacy for reporting/handover and other administrative activities;

j. facilities for changing and for medical staff's overnight stay;

k. rest room and beverage facilities;

m. provision for teaching activities within the unit;

n. daylight and outside views in patient areas and office accommodation.

Visitors

2.12 Visiting times are a matter for local decision. Daytime waiting space, overnight stay and beverage making facilities, as well as access to payphones, will be required. The possibility that visitors may be children, elderly, disabled or emotionally disturbed should be borne in mind.

Clinical teaching

2.13 Seminar facilities, in which clinical instruction and case discussion may take place, are required.

Control of infection

2.14 Prevention of cross-infection is fundamental to patient care in an ITU, with a high standard of hygiene promoted in all areas.

This Note and associated Activity Data Sheets take account of, for example:

- accommodation requirements for source and protective isolation in at least two single-bed rooms. The air supplied being filtered for patients requiring protective isolation. For source isolation the air supplied being discharged directly to the outside and not to any area within the unit;
- adequate provision of handwashing and drying facilities at each bed space, with easy access for staff;
- provision for staff wearing protective clothing where required. The recommendations of the Expert Advisory Group on Aids, given in 'Guidance for Clinical Health Care Workers' January 1990, may assist in identifying the routine precautions to take;
- the handling of "sharps", and the use of "sharps" containers as recommended in BS7320;
- the report 'Decontamination of equipment, linen or other surfaces contaminated with Hepatitis B and/or Human Immunodeficiency Viruses' identified by HC(91)33. Account should be taken of the report's recommendations.

Health and safety

2.15 The requirements of relevant sections of the document 'The Control of Substances Hazardous to Health – Guidance for the Initial Assessment in Hospitals' 1989 should be examined.

Reporting/handover

2.16 Adequate space and auditory privacy should be provided for reporting which will generally take place at or near the staff base. Provision may be made for a two-stage process consisting of a reporting session (for example, involving the incoming nursing shift plus some but not all of the outgoing shift), followed by a one-to-one handover at each patient's bedside.

Blood gas analysis/other pathology tests

2.17 Provision should be made for blood gas analysis to be carried out within the unit, by medical, nursing staff, or technicians. Admission of patients requiring haemodialysis may generate an additional local demand for other biochemistry tests. Other pathology specimens will be sent directly to the pathology department.

Whole Hospital policies

Catering

2.18 Meals for the few patients in an ITU who may require them will be provided on request, and in accordance with the hospital's catering policy. Separate pantries should be provided for the preparation of beverages and light snacks for patients, staff and visitors. Storage space will be required and facilities provided for washing-up beverage crockery.

2.19 Because of working practices and the need to relax within the unit, staff normally take breaks within the ITU. Nevertheless, project teams should seek the advice of the hospital catering manager on all aspects of the provision of catering facilities in the ITU.

2.20 Facilities should be provided in accordance with the hospital's catering policy, and which comply with current food hygiene and safety legislation, for example the 'Food Safety Act, 1990' and the 'Food Hygiene Amendment Regulation, 1990'.

Domestic services

2.21 The accommodation required for storage and cleaning of domestic equipment will be determined by the scope and extent of the service as outlined by the Whole Hospital policy.

Supply, storage and disposal

2.22 Supply and disposal merits careful consideration by the project team, for in few other areas are building and operational policy so inseparable and interdependent.

2.23 The quantity and distribution of storage space required in an ITU can only be specified in terms of a known policy. A disposal hold, for example, however large, must be of finite size, and that size must be related to a given frequency of collection.

2.24 Supply and disposal must be thought of as an entity – supplies must enter the department, be consumed or used and thereafter disposed of, in some instances for processing.

2.25 Project teams must consider:

a. Whole Hospital policies on supply, storage and disposal;

b. the several kinds of items supplied – for example sterile supplies, office supplies, clean laundry, food;

c. the collection and delivery points;

d. the volume and location of storage spaces;

e. specialised storage requirements – for example, pharmaceutical supplies, especially Controlled Drugs;

f. equipment held.

2.26 Efficient control of stock, which usually requires computer support, can effect appreciable, or even substantial, reductions in costs. The value of such a departmental stores management system will be enhanced if it can be linked to an existing hospital supplies management system.

Figure 1 illustrates the siting and purpose of departmental stores.

Organisation

2.27 Organising an efficient and economical system for supply and disposal in an ITU is demanding and complex. In this section the problems are discussed in general terms.

2.28 Systems and timetables for ordering, delivery and disposal should be devised and agreed with the managers of hospital stores, sterile services department (SSD), pharmacy, linen, catering and portering services.

2.29 Knowledge of Whole Hospital materials handling policy is essential. For example, the frequency of delivery of supplies and the amount of storage that must be reserved in the central store will be determined by the storage and delivery policies of a particular department, for example SSD, pharmacy, linen. The lower the frequency of delivery, the greater the capital outlay on the working stock of consumables and non-consumables.

2.30 It is usual for the senior nurse and their nursing colleagues in an ITU to determine their average daily requirements, and create a stock list. Once a stock list has been prepared for each different group of supplies these lists can then be collated and a delivery and ordering policy for the department established to maintain stock levels.

2.31 There are several options available for storage management. For example, an exchange system where all supplies are held on exchange trolleys, the contents having been agreed with the nursing staff. These trolleys are then exchanged daily. Another similar method is the topping-up system where again stock levels are agreed by nursing staff and maintained daily by topping-up.

2.32 Linen may be stored in either a linen store or on a linen exchange trolley depending on the Whole Hospital policy. A parking space for the trolley must be provided.

Disposal

2.33 Items for recycling or disposal will be held in the dirty utility prior to being taken to the disposal hold where they will be collected by portering staff. These items will be separated into relevant groupings – colour coded bags for linen, infected waste and general waste for incineration – in line with Whole Hospital policies.

2.34 Contaminated medical equipment will be sent to the SSD for decontamination in line with Whole Hospital policies – see HBN 13 – 'Sterile services department' (in preparation). Used sterile supplies for reprocessing will be held in an SSD container in the dirty utility.

2.35 Disposal of pressurised containers requires special attention: see SAB(88)79 – 'LPG Aerosol containers: risks arising from storage, use and disposal'. In order to avoid abuse and misuse "sharps" containers should be held in the dirty utility to await collection.

2.36 The size of the disposal hold will be dependent on the amount of waste generated and the number and frequency of collections daily.

Purpose and siting of departmental stores **Figure 1**

Activity / Space	Storage / holding — Categories of items to be stored								
	Medical and surgical inc IV fluids	Pharmacy/ lab. reagents	Controlled drugs	Clean linen	Catering supplies	Stationery	Housekeeping/ cleaning supplies	Mobile medical equipment	Furniture - bulk items
Staff base						●			
Bed areas	●							●	
Bulk supplies store	●						●		
Furniture store									●
Clean utility	●	●	●						
Linen store				■					
Dirty utility									
Clinical equipment store								●	
Laboratory		●							
Workshop									
Staff changing				●					
Staff rest room/ pantry					●				
Patient pantry					●				
Relatives' pantry					●				
Offices						●			
Seminar room						●		●	
Cleaner's room							●		

Activity spaces not used for storage

Entrance / waiting area
Disposal room
On-call room
Equipment service room

KEY

● store
■ policy option could be linen trolley

Figure 2

Disposal cycle							Destination	
Origin of items							Within ITU	Outside ITU
Type of waste	Staff change	Bed areas	Clean utility	Dirty utility	Laboratory	Pantries Staff & patients	Disposal hold	
Instruments hollow ware			●	●			●	S S D
General waste	●	●	●	●	●	●	●	General incineration
Infected waste		●		●			●	Infected incineration
Soiled linen	●	●		●			●	Laundry
Specimens		●		●	●			Pathology
Pharmacy			●					Pharmacy

Figure 2 illustrates in schematic form the point of origin, routing and destination of items for disposal.

Information handling

2.37 Currently, hospitals make significant use of information technology, including patient administration linked to the hospital's patient administration system, supplies ordering and stock control, pathology and radiology systems. A specific requirement for ITUs is a computerised monitoring system which records and analyses trends in the physiological data of a patient. Increasingly, use will be made of expert systems providing diagnostic and prognostic advice. Other systems may also be used for teaching and research purposes. The future thrust will be in the development of interfaces between these systems.

2.38 Provision should be made for a multi-parameter monitor in each bed space. Information registered on the monitor should be repeated at the staff base. Care is needed in the selection of the most appropriate range of parameters to be monitored. Some systems can call up parameters of all patients from a central monitor at the staff base. Increasingly, monitors are capable of their own data processing and are linked together so that it is possible for each monitor to call up the parameters from monitors in other bed spaces. (See paragraphs 5.15 to 5.17.)

Staff changing

2.39 Full changing facilities within the unit are generally only required for nursing staff. Care should be taken to make realistic estimates of full- and part-time nursing staff and to clarify locker allocation policy, taking into account the need for separate facilities for males and females. Other staff may don plastic aprons either routinely on entry to the unit or only when dealing with infected patients. Medical staff may also remove their white coats whilst in the unit. Storage for plastic aprons and hanging white coats should be provided at the entrance to the unit, outside single-bed rooms and in the multi-bed area.

3.0 General functional and design requirements

3.1 This chapter examines the general functional and design implications of service planning and policy issues referred to in Chapter 2. It also includes information on a range of further topics and environmental matters which should be taken into account when designing an intensive therapy unit (ITU).

Location and departmental relationships

3.2 Whilst an ITU should be centrally located within an acute hospital development, for the reasons set out below, it does not specifically require a gound floor location. The location of an ITU is subject to local policy decision.

3.3 An ITU receives patients primarily from the operating department, accident and emergency department and medical and surgical wards. Rapid transfer of patients from the above departments will necessitate easy access, physical proximity, or short journey times. Locating the ITU adjacent to the operating department allows for emergency evacuation of patients into the operating department's post-anaesthesia recovery area where medical gas and electrical outlets are readily available.

3.4 Although transmission of reported radiology results may be achieved electronically, access to radiology facilities is still desirable in order to facilitate rapid processing of films. Access to the scanner suite is also desirable.

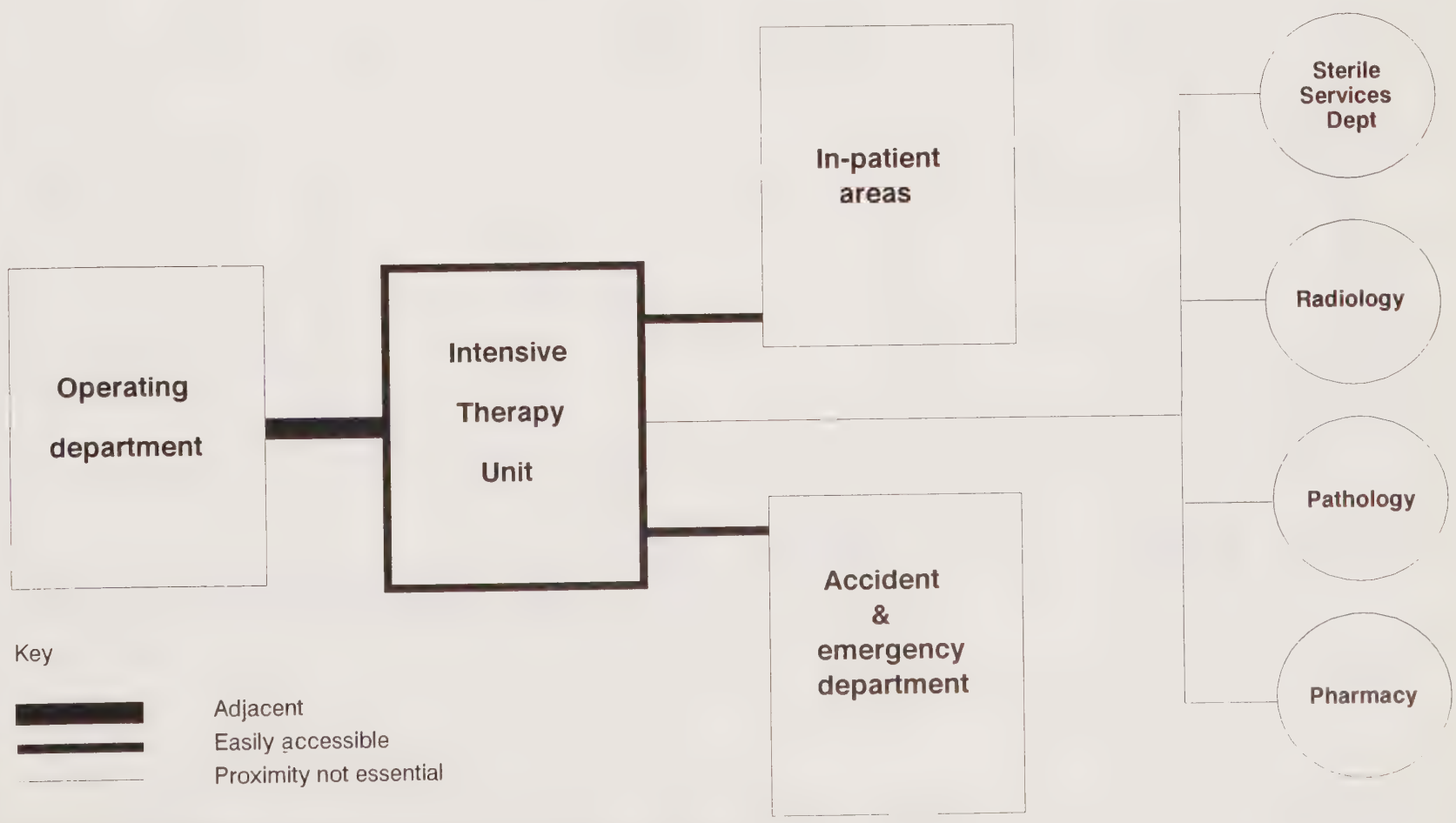
3.5 Both transport of specimens to the pathology deparment and receipt of test results may be possible by mechanical and electronic means. Physical proximity of the ITU to the pathology department is therefore not essential.

Figure 3 illustrates departmental relationships within a hospital.

Layout and planning relationships

3.6 The layout should achieve a balance between providing privacy for patients, in both single-bed rooms and multi-bed areas, and providing unobstructed observation of patients, particularly by nursing staff. These requirements influence the physical relationship between the staff base and the bed spaces, and the design of the staff base. Requirements for services to bed space and for equipment around the bed will also have an effect on space provision

Departmental relationships within a hospital **Figure 3**



and layout. See the ergonomic drawings in Appendix 1 and the standard demand for equipment per patient per bed, as detailed below, for an average patient in a District General Hospital (DGH) requiring both artificial ventilation and continuous multi-parameter monitoring (on which the guidance in this Note is based):

a. multi-parameter monitor, for example ECG, B/P, other pressure, temperature;

b. ventilator and humidifier;

c. 4 infusion pumps;

d. 4 syringe pumps;

e. suction apparatus low pressure;

f. suction apparatus high pressure;

g. examination lamp;

h. pulse oximeter.

3.7 In order to provide an efficient working environment for staff, the layout should also take account of key functional relationships between activity spaces, such as bed areas and utilities, and staff areas and bed areas. (See Figures 4a and 4b.)

Communications

3.8 Staff/staff and cardiac arrest call systems are essential. Patient/nurse call systems may also be required. Call points are indicated on the Activity Data Sheets. A visual and audible indication of operation should be provided at the staff base to give responding staff unambiguous identification of the call course and priority. (See paragraph 6.83.)

3.9 Whilst staff within the multi-bed unit are already in direct contact with each other, a staff communication system linking each bed space to the staff base, support spaces and staff facilities is essential, for rapid response to a call. This can be achieved in a variety of ways, including the provision of a two-way speech facility, and closed circuit television. Care needs to be taken in selecting equipment appropriate to the plan form of the ITU. For the costed option refer to Chapter 6.

Telephones

3.10 Central telephone facilities for internal and external calls should be extended to serve the unit in accordance with the requirements shown on the Activity Data Sheets.

Internal departmental relationships — Figure 4a

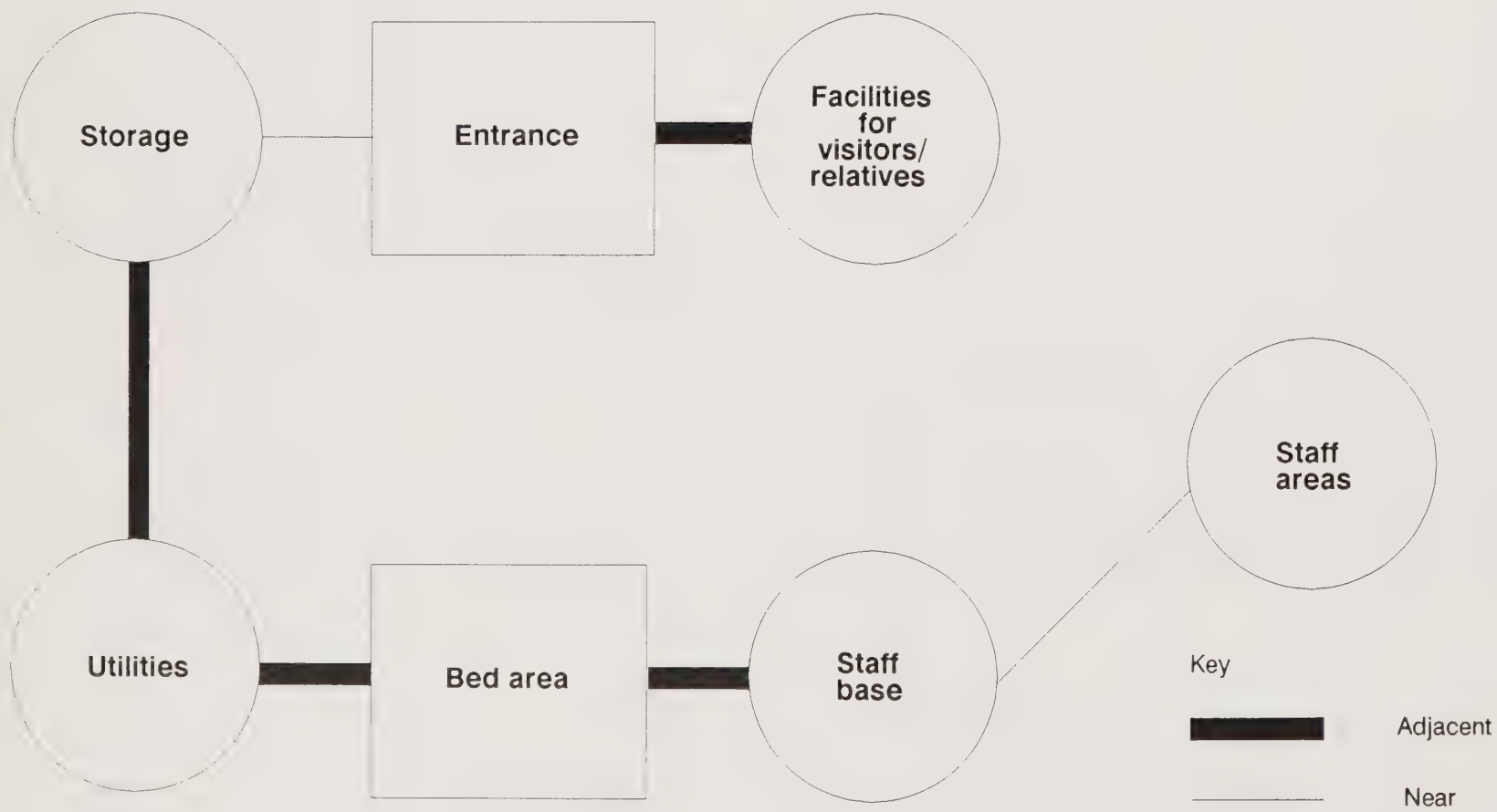
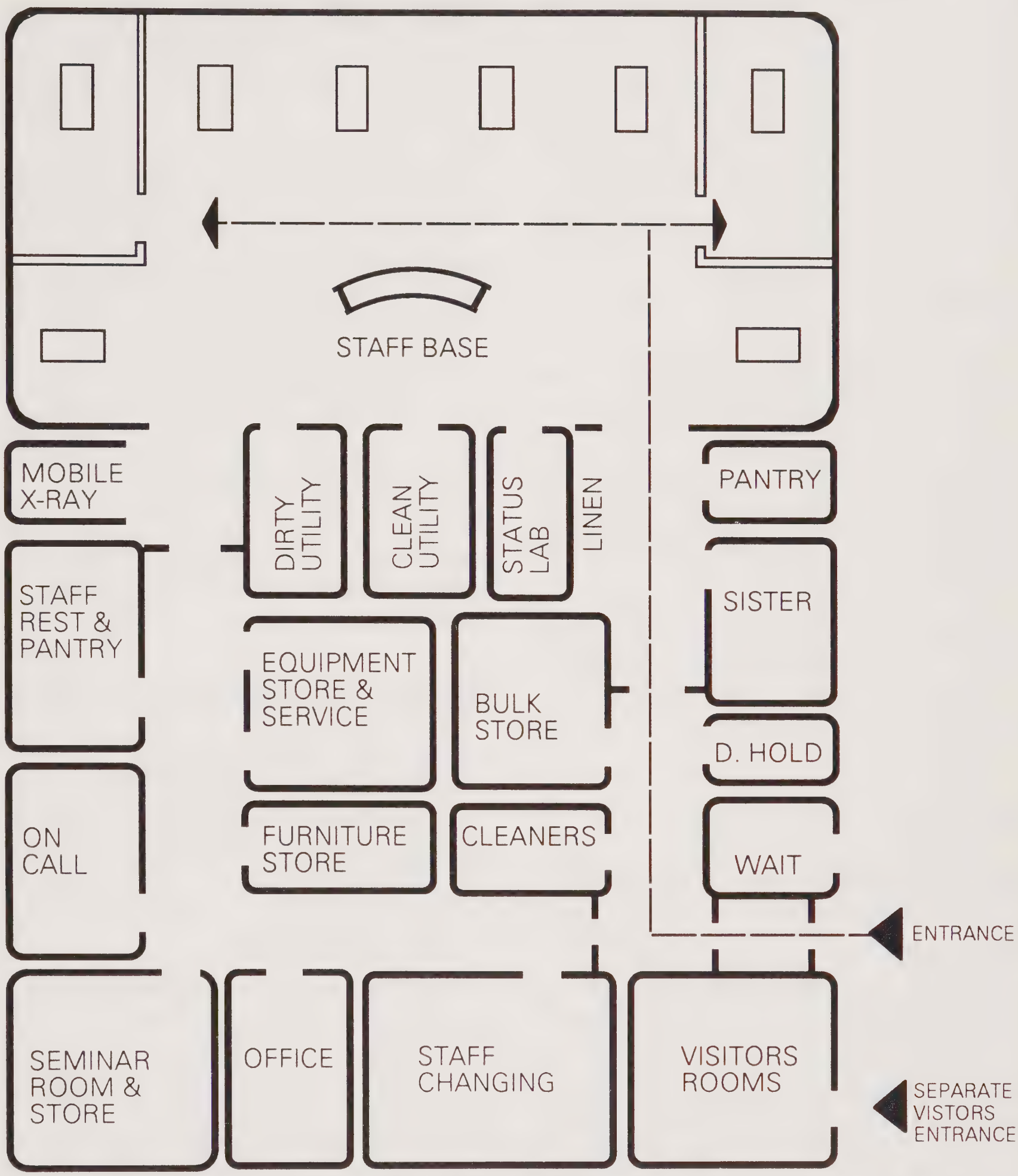


FIGURE 4 b



INTENSIVE THERAPY UNIT

Wiring should terminate at each extension point in a standard line jack unit. When telephones are fitted with an audible bell or buzzer this should be fitted with a muting facility for night-time operation. All telephones should be fitted with visual indicators.

3.11 Outlets should be provided for fixed payphones for the use of staff and visitors only. Payphones for use by visitors should be located near to the visitors' accommodation and the waiting area, and should be fitted with an inductive coupler to assist people using a hearing aid. Guidance concerning the provision of telephone services, including the telephone internal cabling distribution and telephone handsets, is given in HBN 48 – 'Telephone services'.

Security/control of access

3.12 Security measures are needed to control unauthorised access to the ITU and to reduce the likelihood of thefts from changing areas, supply areas and pantries. It is recommended that access through the main entrance to the ITU be controlled by use of an entryphone/intercom system, linked to the staff base. Digital locks should be fitted to changing room doors. A staffed reception area is not likely to be required. The security measures chosen must not inhibit emergency escape from the unit or access by the staff at any time.

3.13 An added benefit of the entryphone system is the control of access by visitors to prevent them entering the bed areas at inappropriate times, for example, during reporting/handover or whilst procedures are being carried out.

Fire safety

3.14 To ensure progressive evacuation to areas capable of accepting patients reliant on life-support equipment, great care needs to be taken in the choice of location for the ITU in relation to other departments. The use of the post-anaesthesia recovery area of the operating department is the most desirable area for receiving patients evacuated from the ITU.

3.15 It is essential that project teams familiarise themselves with the guidance in the Firecode series of documents which contain the Department's policy and technical guidance on fire precautions in hospitals and other NHS premises. In particular, the need for structural fire precautions and means of escape from the whole accommodation must be taken into account at the earliest possible planning stage. The key document for these aspects in hospitals is Health Technical Memorandum (HTM) 81 – 'Firecode: Fire precautions in new hospitals'.

3.16 In addition, basic policy, principles and key management guidance are contained in 'Firecode: Policy and Principles'. Other Firecode documents include the HTM '80' series which give technical guidance on various building, engineering and equipment issues, the 'Fire Practice Notes' series dealing with specialist aspects of fire precautions, and Nucleus guidance. The series includes 'Firecode: Directory of fire documents' which lists references to relevant legislation and relevant fire precautions guidance issued by DH and other sources, for example, the Home Office.

3.17 It is important to establish during the design stage those aspects of fire safety strategy which affect the design, configuration and structure of a unit. At appropriate stages of the design process the architect and engineer should discuss and verify their proposals with the local fire authority, and ensure that the project team and all other planning staff are fully acquainted with the fire safety strategy for the design in terms of operation (staff responsibilities etc, equipment provision, and building and engineering layouts). Health Technical Memoranda 56 – 'Partitions', 57 – 'Internal glazing', 58 – 'Internal doorsets', 59 – 'Ironmongery', 60 – 'Ceilings' and 65 – 'Signs' give detailed information on the selection of fire-resisting components and fire signs.

3.18 The principles of fire safety apply equally to new projects and to alterations and upgrading of existing buildings.

Internal environmental considerations

3.19 A restful atmosphere for patients and attractive working environment for staff can be created by appropriate use of lighting and colour and attractive furnishings and finishes. It is, however, essential that the choice of lighting and colour should not adversely affect the clinical assessment of patients.

Natural and artificial lighting

3.20 Daylight is essential for both patients and staff orientation. An external outlook is beneficial for some patients and all staff. Windows should be provided in bed areas and also in those areas occupied by staff, such as offices and staff rest rooms. Where the ITU is located on the ground floor, it may be necessary to provide glazing which allows staff and patients to see out but prevents anyone else from seeing in.

3.21 Lighting at the bed should provide for patient observation whilst also providing for a minimal level of lighting at night by selective or variable switching of luminaires. A mobile examination light should also be available. At night, lighting levels adjacent to the bed should enable staff to monitor all invasive lines and drainage bottle levels.

Noise and sound attenuation

3.22 The ITU should be located away from noise generating departments. Careful consideration should also be given to deciding where, within the unit, monitoring equipment alarms will sound.

3.23 Provision should be made to ensure confidentiality for staff reporting/handover activities.

Ventilation

3.24 Whilst all bed areas should be mechanically ventilated and cooled, other areas should be naturally ventilated, where possible.

3.25 Both single-bed rooms should be provided with a system which can provide "source and protective isolation" of the patient.

3.26 Single-bed rooms should be provided with humidity control and local adjustable temperature control.

Heating

3.27 General space heating can be supplied by low pressure hot water radiators. They should be of the low surface temperature type, free of sharp edges and easy to clean. Exposed hot water pipework, accessible to touch, should be insulated.

Smoking

3.28 Health Circular HC(85)22 dated May 1985 (in Wales, WHC(85)31) reviews the problems presented by smoking in health buildings and, while recognising that the responsibility for determining local policies rests with the health authority, recommends that smoking should be confined to specially designated areas which are clearly signposted. In an ITU the whole unit may be designated a "no smoking area"; failing this, smoking should be limited to an area within the staff rest room. In smoking areas ventilation should be sufficient to prevent discomfort to non-smokers and the spread of odours to other areas of the unit.

Finishes

3.29 The choice of finishes should form an integral part of the design process and should be co-ordinated within the overall design scheme. Finishes should be functional and be compatible with the need for comfort, cleanliness and safety. The quality of finishes should, in general, conform with the standard of finishes specified for the rest of the hospital. Cleaning regimes should be considered when materials are selected.

Floors

3.30 Floors in an ITU have to withstand harsh treatment, including:

- the rolling loads of heavy mobile equipment;
- frequent spillages with subsequent "mopping-up";
- regular hard cleaning.

Flooring should be slip resistant under wet conditions. Coved skirtings make for easy cleaning; the material used should be integral with, and have properties similar to, the floor finish.

3.31 Floor finishes can be either flexible tiles or sheet; joints should be welded. Such flooring is tolerant of small movements in the structural floor. The floor screed must be perfectly smooth, crack-free and stable. Adhesives must be powerful enough to resist the formation of "waves" in the floor finish which can result when heavy equipment is moved. Thresholds at doorways between adjacent rooms are points of stress in the floor finish, and design requires particular attention. (See HTM 61 – 'Flooring'.)

3.32 The comfort of people who work long hours in an ITU should be considered. They often prefer a resilient to a hard finish, and a light-coloured finish to a dark finish.

3.33 Carpets are suitable for use in the offices, staff rest room, overnight stay accommodation and visitors' waiting areas. For further information on soft floor coverings see HTM 61.

Walls

3.34 Wall finishes in an ITU must be durable and able to withstand wet cleaning and the accidental impact of trolleys and heavy mobile equipment. Especially vulnerable points should have additional protection. Paint, sprayed plastic skin, and plastic sheet with welded joints, have been found to satisfy these requirements; the type of material used should take into account the possibility of movement of structural walls.

3.35 Joints between sheets should be sealed to prevent water penetration when the walls are washed. Walls, like floors, should be matt, light in colour, and should not distort the colour rendering of light sources. Strong or dark colours should be avoided.

Ceilings

3.36 Noise in an ITU can be reduced by an acoustically absorbent ceiling. While some acoustic surfaces now available do not present a microbiological hazard it is essential that the architect, ventilation engineer and hospital Infection Control Officer should together ensure

that the choice of ceiling and the maintenance routines are satisfactory. The ceiling in single-bed rooms must be sealed.

Doors and frames

3.37 Doors and frames are particularly liable to damage from mobile equipment, and materials which will withstand this should be used. All double swing doors should incorporate clear glass vision panels, but privacy, safety, or other considerations may require that the panels should be capable of being obscured. Where necessary, doors except fire-resisting doors should be capable of being fastened in the open position. Magnetic door retainers should not restrict the movement of traffic. Doors to single-bed rooms must be tight fitting with seals to minimise air transfer in the closed position.

Windows

3.38 The design of windows is inevitably a compromise. In addition to the various statutory requirements, the following aspects require consideration: daylighting and natural ventilation; insulation against noise; user comfort; energy conservation; the prevention of glare; the provision of a visual link with the outside world.

3.39 Design should ensure that it is possible for cleaners to have easy access to the inside and outside of windows. Guidance on types of windows and on the safety aspects is available in HTM 55 – 'Windows'. Windows in the single-bed room and multi-bed areas should be fixed non-openable. The single-bed rooms should have sealed units.

Maintenance and cleaning

3.40 Materials and finishes should minimise maintenance and be compatible with their intended function. Building elements that require frequent redecoration or are difficult to service or clean should be avoided. Special consideration should be given to elements such as door sets, corners, partitions, and counters which may be subject to heavy use. Floor finishes should be restricted in variety and, where soft floor coverings are specified and spillage likely, should have a backing impervious to fluids and a non-absorbent pile. Wall coverings should be chosen with cleaning in mind. Advice on these topics is published in HTMs 56 – 'Partitions', 58 – 'Internal doorsets' and 61 – 'Flooring'.

Signposting

3.41 HBN 40 – 'Common Activity Spaces; Volume 2, Corridors', and HTM 65 – 'Signs', should be consulted for general guidance.

4.0 Specific functional and design requirements

Introduction

4.1 This chapter provides guidance on functional requirements and design implications for each of the activity spaces in an intensive therapy unit (ITU).

4.2 Lists of activities and equipment and details of environmental conditions and finishes of walls, floors and ceilings are all identified in Activity Data Sheets (see Chapter 8).

Functional relationships

4.3 An ITU contains three zones: patient bed areas, associated support facilities and staff areas. Both within and between these zones are key functional relationships which should be taken into account when designing accommodation. Details of these relationships are given below.

Staff base/patient bed areas

4.4 Although nursing staff will generally be based in the patient bed areas, visual and aural observation of patients from the staff base is still important, particularly at night. A balance should be struck between providing adequate observation for staff and also privacy for patients.

Patient bed areas/utilities and equipment storage

4.5 Utility areas and medical equipment storage should be located to provide ease of access to patient bed areas and also security of supplies and equipment. The multi-bed areas should not be used as a thoroughfare to these support spaces (see Figures 4a and 4b).

Patient bed areas/staff areas

4.6 Staff rest rooms and offices should be located far enough away from patient bed areas for staff to withdraw from activity within the unit, but also close enough for staff to return quickly to the patient bed areas if required.

Bed space/bed space

4.7 The layout of the multi-bed area and relationship to the single-bed rooms should enable nurses to easily call for assistance from one bed space to another.

Observation

4.8 Factors to be considered include the physical relationship between the staff base, single rooms and multi-bed areas, the design of the staff base, the positioning of glazing panels around single rooms, and the positioning of mobile equipment within bed areas.

DESCRIPTION OF ACCOMMODATION

Entrance/waiting area

4.9 All patients, visitors, staff and supplies access the unit through a single entrance area. The entrance should be the delivery point for supplies and the collection point for specimens. As the entrance will not generally be staffed, measures will be required to control unauthorised access and to prevent theft of equipment, supplies and personal belongings. Appropriate staff may be provided with a pass key or number to facilitate access for deliveries and collections. A bell or entry-phone system connected to the staff base should be used to control access to the ITU by relatives or visitors. The entrance will be an emergency escape route from the unit. A waiting area should be provided adjacent to the entrance to accommodate visitors awaiting access to the unit. This waiting area should include a payphone, fitted with an inductive coupler to assist people using a hearing aid, and have access to a WC.

Staff base

4.10 Activities taking place at the staff base will include observation of patients, reporting, report writing, telephoning, clerical work, teaching/discussion, viewing X-rays, examining trends data on a central monitor, use of computers, and control of access to the unit. The likely numbers of nursing staff, the choice and location of monitoring and computing equipment, storage policies and requirements for notes, X-rays, request forms and other stationery must also be considered. Work-surface provision should cater flexibly for differing and evolving configurations of computers and monitors. (See the ergonomic drawings in Appendix 1.)

Bed areas

4.11 Because of the need for good staff access around the patient, an island bed layout is preferred to a peninsular solution. (See paragraph 3.6.)

4.12 The 'Intensive Therapy Units, Stage Two – Case Study Analysis' produced by MARU for the Department of Health in June 1988 drew attention to the need to provide an adequate number of electrical socket-outlets at each bed. It concluded that insufficient outlets "result in the use of extension plugs to cope with the wide range of equipment in use at the same time – this can include as many as 9 infusion pumps, ventilator, monitors, air mattress, dialysis machine, humidifier, fans, suction machine, and TV". To meet increasing demand, the current recommendation is for 24 socket-outlets at each bed. The chosen method of supply of medical gases and electrical socket-outlets should allow unimpeded access to the patient by medical and nursing staff. A strategy based on services supplied from the ceiling provides unobstructed access and uncluttered floor space around the patient's bed. The majority of patients will be attached to various life-support equipment, including a multi-parameter monitor, a ventilator, syringe and infusion pumps, and other specialised equipment. Appendix 2 lists the items of equipment usually present in a bed space together with the associated service requirements.

4.13 Windows and natural light are essential in the single-bed rooms and multi-bed areas as an aid to patient orientation. Outside views are desirable.

Single-bed rooms and gowning lobbies

4.14 Single-bed rooms are used for source and protective isolation of patients. They may also be used:

a. if a patient requires additional privacy, peace and quiet;

b. for confused or aggressive patients;

c. for patients requiring haemodialysis;

d. for paediatric patients.

4.15 All single-bed rooms should provide protective and source isolation. Entry should be via a gowning lobby providing a clinical handwash basin, a plastic apron dispenser and storage space for white coats as well as facilities for disposing of used aprons and coats. Ceilings and windows should be sealed. Doors should be tight fitting with seals to minimise air transfer. (See paragraph 6.37.)

4.16 Single-bed rooms should allow for manoeuvring bulky equipment, for example a mobile X-ray machine, and space for staff to undertake procedures from all sides of the bed. A clinical wash-hand basin should be provided in each room.

4.17 Haemodialysis will normally be carried out in the single-bed rooms, but there may also be a requirement to make some provision for haemodialysis in the multi-bed area. This is unlikely to exceed two bed spaces. Most current haemodialysis equipment requires a dedicated de-ionized water supply, drainage, and bed spaces large enough to accommodate the haemodialysis equipment. However, some haemodialysis equipment does not require drainage or water supply. Storage for associated fluids, tubing and for dialysis equipment when not in use should also be provided elsewhere in the unit. Haemofiltration is now used more extensively because of simplicity of use and reduced service requirements. (See paragraph 6.46.)

Multi-bed area

4.18 Adjustable bed space division is desirable to cater for the varying service and equipment requirements generated by different types of patients. Small, lightweight screens offer privacy to patients and can be readily moved.

4.19 The size and shape of each multi-bed space should allow space for the use of mobile equipment and room for staff to undertake procedures from all sides of the bed. Multi-bed spaces may, on occasion, be used for haemodialysis. A clinical wash-hand basin should be provided in each bed space.

4.20 Movement of patients from one bed space to another within the unit is likely to be infrequent but may occasionally be necessary if a patient requires isolation or access to haemodialysis facilities. (See the ergonomic drawings in Appendix 1.)

Bedside storage

4.21 There are several ways of providing bedside storage. A balance has to be kept to avoid the costly waste of over-ordering and stocking as well as infection control problems of stocking too many items at the bedside that may not be used. Ideally storage provision at the bedside should be kept to a minimum and is only required for charts and small quantities of medical and surgical supplies for the treatment of an individual patient. A surface for note writing, and for preparation of procedures, is also necessary. Storage may be on free-standing units in the area to the front of the bed or on supply trolleys.

4.22 Storage of patients' clothes and personal effects will be dealt with in accordance with Whole Hospital policy but will not normally be at the bedside. Some personal items may be held at the bedside for the benefit of the patient's orientation and emotional support. This may vary from unit to unit and may depend on the type of patient and length of stay.

Clean utility

4.23 The clean utility should provide space for preparing trolleys for sterile procedures, preparing and checking drugs and for storage of sterile supplies, procedure packs, Controlled Drugs, intravenous fluids, and medical and surgical supplies. This space should be easily accessible from the staff base and bed areas. Small quantities of supplies may also be held near each bed space for immediate use.

Empty pharmacy boxes may be kept in the clean utility for collection by the pharmacy porter. (See the ergonomic drawings in Appendix 1.)

Dirty utility

4.24 The dirty utility provides facilities for disposal of contents, following use, of bedpans, urine bottles, vomit bowls, washbowls etc, although in an ITU the use of bedpans and urine bottles is very limited. The dirty utility should be situated close to the patient areas. Project teams must decide between using disposable bedpans and a bedpan macerator or a bedpan washer/disinfector, and plan accordingly.

4.25 A limited stock of either disposable or non-disposable items, such as bedpans, urine bottles and vomit bowls will be stored here.

4.26 The dirty utility is also used for urine testing and holding specimens.

4.27 Space for holding of materials for disposal or reprocessing should be limited because sacks and bags, once full, should be closed and taken to the disposal hold to await collection. The Whole Hospital policy for disposal will determine the frequency of collection. "Sharps" containers will be held in the dirty utility for collection by portering staff.

4.28 Mechanical extract ventilation and hand washing facilities should be provided.

Disposal hold

4.29 This room should be accessible to the hospital street. Collections (except for "sharps" containers which are held in the dirty utility for security reasons) may then be made without portering staff needing to enter the main circulation space of the unit.

4.30 Bagged refuse and soiled linen are held here safely and securely while awaiting collection. They are identified by colour-coding, in line with Whole Hospital policy.

4.31 The size of the disposal hold should be determined by the frequency of collection.

Storage

Bulk supplies store

4.32 This space is intended as a bulk supplies holding store for medical and surgical supplies and intravenous fluids from which to stock the clean utility and other areas. The amount of storage required will be determined by local supplies policy – whether topping-up, exchange trolley, or requisitioning – for each commodity, stock holding and frequency of deliveries, although it is recognised that there has been a move away from this to "just-in-time" buying. (See the ergonomic drawings in Appendix 1.) A holding bay is provided immediately adjacent to the store for receipt of delivered items prior to sorting.

Linen storage

4.33 Storage is required for linen supplies, either in a linen store or on a linen exchange trolley. The amount of linen storage needed will depend on the linen supplies policy and the number of patients.

Mobile X-ray equipment bay

4.34 An open bay should be provided close to the clinical equipment store for the storage of mobile X-ray equipment and protective lead aprons. A socket-outlet should be provided for charging the mobile X-ray equipment.

Furniture store

4.35 This store will hold beds, bed cradles, cots and other bulky items of furniture when they are not in use.

Clinical equipment store

4.36 Floor space within this store is needed for a variety of equipment including drip stands, monitoring equipment, and haemodialysis equipment. Shelf space is needed for smaller items of equipment such as infusion pumps, ventilator accessories, monitoring equipment and suction apparatus. Electrical socket-outlets are required for charging equipment. Underprovision of equipment storage may lead to unused equipment being kept in bed areas. This store should be located within easy access to the bed areas and adjacent to the equipment service room. (See the ergonomic drawings in Appendix 1.)

Equipment service room

4.37 Facilities are required within this room for user-servicing as defined in the user manuals supplied by equipment manufacturers, supplemented by any formal local instructions that have been agreed. Such local instructions may require the provision of additional facilities. This room should also be used by visiting electronics and medical engineering (EME) technicians to carry out minor scheduled or unscheduled servicing. The space provision should be sufficent to park and manoeuvre equipment and accommodate a work bench with integral lockable cupboards, preferably in a self-contained room or space. A wash-hand basin should also be provided. It is recommended that manufacturers' user manuals are kept in this room. The supply to socket-outlets should be provided via a residual current protected circuit device, and

emergency power isolation buttons should be installed at the workbench and adjacent to the room entrance. Medical gas outlets supplying oxygen, medical compressed air and vacuum should be provided. Nitrous oxide together with gas scavenging facilities may be provided as a project option. Some items of equipment may require decontamination in the sterile services department (SSD) prior to scheduled servicing being done elsewhere. Local policy will identify where this will be undertaken (for example, in the SSD, and/or EME). A lobby associated with the equipment service room will provide space for holding equipment awaiting repair and/or calibration.

Laboratory

4.38 A status laboratory is required for blood gas analysis and other tests carried out within the unit. The main requirements are for a sink, laboratory benching and adequate bench space on to which equipment will be placed, electrical socket-outlet provision, a specimen fridge, and sufficient space for staff to perform tests and use computer equipment. Separate hand washing facilities are also required. As this is a staff working area, access to daylight is desirable. This space will be in intermittent usage throughout the day and night. (See the ergonomic drawings in Appendix 1.)

Staff changing

4.39 Full changing facilities are likely to be required only for nursing staff. Changing facilities for medical and paramedical staff, technicians and domestic staff will generally be provided elsewhere in the hospital.

4.40 Space is required for changing, clothes storage, showers and sanitary facilities. Estimates of changing space and locker provision should take into account the numbers of full-time and part-time nursing staff and also the locker allocation policy (see HBN 41 – 'Accommodation for staff changing and storage of uniforms'). Provision should also be made for male as well as female nursing staff. Steps should be taken to ensure the security of personal belongings left in the staff changing areas. (See paragraphs 3.12 and 5.5.)

Staff rest room/pantry

4.41 The staff rest room may be used for meal, tea and coffee breaks. Account should be taken of the total numbers of staff working in the unit and also the effect of shift overlaps. Smoking policy should be clarified so that both smokers and non-smokers are catered for, in separate areas. The staff rest room should be located away from, but within easy access to, the bed areas and should have good staff communication links with the rest of the unit. It should have natural daylight and an outside view.

4.42 Facilities are required for making beverages and snacks, and for washing-up. Facilities provided may include a sink/drainer, refrigerator, microwave oven, toaster, drinks machine and storage space for crockery and dry goods. A separate hand washbasin will be required. The pantry may be provided as a separate space adjacent to the staff rest room, or as an integral part.

Patients' pantry

4.43 The patients' pantry will be used for preparation of beverages and snacks and for receipt of meals from the central kitchen for the few patients requiring them. If a cook-chill system is in operation, space will be required for holding and manoeuvring chilled meal service equipment.

On-call facilities

4.44 Doctor's on-call facilities are required within the unit and should include provision for en suite shower/WC. On-call facilities may be provided separately or combined with one of the doctor's offices. The facilities required include a bed, clothes storage, a washbasin and a desk and chair. This space should be linked into the staff communication system.

Facilities for relatives – waiting area, overnight stay, pantry

4.45 Both day and overnight stay facilities for relatives are required. The latter may be provided elsewhere in the hospital, but the preference is generally for provision within the unit.

4.46 The scale of facilities provided will depend on the size of the unit. Accommodation can be planned either as separate waiting and overnight stay rooms or as a suite of dual purpose waiting and overnight stay rooms, the latter offering greater flexibility of use. Overnight stay rooms will include outlets for radio and television. Relatives will also require access to sanitary facilities, beverage provision and telephone facilities.

Office accommodation

4.47 Activities requiring office accommodation include unit administration, interviewing of staff, counselling of relatives, telephoning, teaching and research work. Facilities will be used by medical and nursing staff. A minimum of two rooms is likely to be necessary to accommodate the needs of medical and nursing staff. An X-ray viewer is required in one of the rooms. (See HBN 18 – 'Office accommodation in health buildings'.)

Seminar room

4.48 A seminar room should be provided within the ITU. The space should accommodate up to ten people and contain secure storage for audio-visual aids. The seminar room may also be used as a base for a clinical teacher attached to the unit. The hospital education centre will be used for other more formal and programmed teaching events.

Cleaners' room

4.49 A ventilated room within the unit is required for the storage of cleaning supplies and domestic equipment. Facilities should be provided in this space for filling and emptying cleaning equipment. A separate wash-hand basin with hot and cold running water should also be provided. (See 'The Control of Substances Hazardous to Health – Guidance for the Initial Assessment in Hospitals', relating to safe storage and use of chemicals and cleaning materials.)

Switchcupboard

4.50 The departmental switchcupboard housing the main isolators and distribution fuse switchgear, should be:

a. sited within the department;

b. accessible directly from a circulation area providing clear and safe access for maintenance staff (access space may be part of the circulation area);

c. sited away from water services;

d. lockable.

4.51 Care should be taken to ensure that safety is not compromised during maintenance from passing traffic or the opening of adjacent doors.

Assisted bathroom/WC

4.52 Admissions policies and length of stay vary from unit to unit and project teams should therefore consider whether provision of an assisted bathroom is necessary. Facilities required include a height adjustable bath, stretcher hoist, WC and wash-hand basin.

5.0 Other general functional and design requirements

5.1 This chapter contains guidance on aspects of function and design which are common to health buildings generally and which will need to be borne in mind when designing new buildings or upgrading existing premises.

Statutory and other requirements

5.2 This Note takes account, as far as possible, of all statutory and other requirements in force at the time of publication, but health authorities are reminded of their responsibility for ensuring compliance with all relevant statutes, regulations, codes and standards. Advice on this is given in circular HC(88)60/HC(FP)(88)29 (in Wales, WHC(89)20).

5.3 With the general removal of Crown immunity from the NHS from 1 April 1991 and the setting up of NHS Trusts, building and planning law are legally enforceable on the NHS. Guidance on the removal of Crown immunity is given in circular HN(90)27/LASSL(90)15 (in Wales, WHC(91)4) in respect of a wide range of legislation.

Works Guidance Index

5.4 Whilst this Note provides guidance that is current at the time of publication, it must be borne in mind that there are wider considerations associated with high risk infectious diseases, fire, energy conservation etc covered by other published guidance which must also be taken into account. Additionally, some aspects of the guidance in this Note may from time to time be amended or qualified. Project teams should first check the current edition of the Works Guidance Index. Because the Index is published in May each year and only updated in September and January, project teams should ensure that they investigate the possibility of changes not included in the latest published index.

Security

5.5 Assaults on hospital staff and theft of NHS property are recognised problems. The project team should discuss security with the officer in charge of the local police crime prevention department and the hospital or district security officer or adviser at an early stage in the design of the building. Fire and security officers should be consulted concurrently because the demands of security and fire safety may sometimes conflict. The attention of planners is drawn to HSG(92)22 (in Wales, WHC(92)46) about security and the revised NHS Security Manual to which it refers.

Upgrading or adaptation of existing buildings

5.6 The standards set out in this guidance are for the provision of an ITU by new building, and it is not intended that they should be applied retrospectively to existing stock. However, the principles are equally valid and should be applied, so far as is reasonably practicable, when existing accommodation is being upgraded or new accommodation is being constructed within an existing building, which may previously have been used for other purposes.

5.7 The cost of upgrading work should conform to the guidelines indicated in the Department's WKO letter (81)4 (in Wales, AWO(81)8). The guidelines take into consideration the estimated life of an existing building, and the difference in cost between upgrading the building and a new building.

5.8 Before any decision is made to carry out an upgrading project, consideration must be given to the long-term strategy for the service, the space required for the new service, and the size of the building. Regard must also be paid to the adequacy and location of all necessary support services.

5.9 If there emerges a prima facie case for upgrading, a thorough analysis of all functional and physical conditions of the existing building should be undertaken.

5.10 When comparing the cost of the upgrading or adapting an existing building to that of a new building, in addition to the building cost, due allowance must be made for:

a. the cost of relocating people;

b. demolition, and salvage costs;

c. disruption of services in a phased project;

d. the temporary effects on running costs of any impaired functioning of areas affected by upgrading.

5.11 The check of physical and other aspects of existing buildings should include:

- availability of space for alterations and additions;
- type of construction;
- insulation;
- age of the buildings, condition of fabric: for example, external and internal walls, floors, roofs, doors and windows, which may be determined by a condition survey;

- life expectancy and adequacy of engineering services, ease of access and facility for installation of new wiring and pipework, if required;
- the height of ceilings (high ceilings do not necessarily call for the installation of false ceilings which are costly and often impair natural ventilation);
- changes of floor levels to obviate hazards to disabled people;
- fire precautions;
- physical constraints to adaptation such as load-bearing walls and columns.

5.12 Having decided that existing premises are suitable for upgrading or conversion, the main requirement will be to assess how best the accommodation can be planned so as to facilitate the practice of modern care.

5.13 This summary of the main aspects of upgrading is general in character and it is recognised that each upgrading project will present its own individual problems. In many instances compromises may have to be made between Building Note standards and what it is possible to achieve. Upgradings should be functionally sound – not merely cosmetic – and appropriate for the projected needs of patients and staff for a number of years to come.

Component Data

5.14 The Component Data Base consists of a series of Health Technical Memoranda (HTMs) which provide specifications and design guidance on building components for health building which are not adequately covered by current British Standards. No firms or products are listed. HTMs in the series are listed in the Bibliography.

Provision for automatic data processing

5.15 Information technology has a central role in health management. The use of computers and telecommunications – and, indeed the rate of technological innovation – continues to increase. The implications for project teams are threefold: firstly, a requirement for the housing of the computers; secondly, a requirement for the provision of ducts for transmission cabling; and thirdly, sufficient space and adequate power supplies for modems, visual display terminals (VDTs) and printers, and associated software and stationery. Even if the introduction of automatic data processing (ADP) is not proposed at the time that the project team completes its brief it will be advisable to design in such a way that equipment can be introduced easily and quickly at some later date.

5.16 There are two principal matters of concern: visibility and noise. VDTs are now a familiar sight, and it will easily be appreciated that they cannot be reduced beyond a certain size. Consequently, sufficient and convenient space must be provided for them. Since the brightness of the letters displayed on the screen cannot exceed a certain limit, special attention must be given to the ambient lighting to ensure that the contents of the screen are legible. Additional space will be required in front of the screen for a keyboard. Printers are often noisy. Noise may not be too noticeable in bed areas during normal working hours but during quiet hours it will probably not be acceptable. If it is not possible to position a printer at a site remote from patient areas, expenditure on a quieter printer or on means of quietening a noisy printer can be justified.

5.17 Computer expertise is now widely available in the NHS and project teams should ensure that, at an early stage, they inform themselves concerning current and projected local computing policies, and that their proposals conform with them.

Disabled people

5.18 It is essential to ensure that suitable access and facilities are provided for disabled people who have problems of mobility or orientation. This includes, besides the wheelchair-bound, those who for any reason have difficulty in walking and those with a sensory handicap such as a visual or hearing impairment. Authorities are reminded of the need to comply with the provisions of the Chronically Sick and Disabled Persons Act 1970, as amended by the Chronically Sick and Disabled Persons (Amendment) Act 1976, the Disabled Persons Act 1981 and The Building (Disabled People) Regulations 1987. Attention is also drawn to BS5810: 1979 'Access for the Disabled to Buildings' (under review). One of the effects of the 1981 Act is to apply this British Standard to premises covered by the 1970 Act, which includes those open to the public. Practical guidance for complying with The Building (Disabled People) Regulations is issued by the Department of the Environment under Approved Document M: Access for the Disabled.

5.19 Project teams are encouraged to refer to HBN 40 – 'Common Activity Spaces; Volume 4, Designing for Disabled People'. This gives guidance and a set of ergonomic data sheets on access, space and equipment relating to disabled people in health buildings.

6.0 Engineering services

Introduction

6.1 This chapter describes the engineering services contained within the intensive therapy unit (ITU) and how they integrate with the engineering systems serving the whole site. The guidance should not inhibit the design solution, but will acquaint the engineering members of the multi-disciplinary design team with the design criteria and material specification needed to meet the functional requirements.

6.2 Documents referred to by number: for example [10] are listed at the end of this chapter. They are numbered in order of first appearance. Each repeated reference retains the same number.

Model specifications

6.3 A series of model specifications, for specialised engineering services in health-care buildings, have been issued nationally and are sufficiently flexible to meet local needs. The cost allowance is based on the qualities of material and workmanship described in the relevant parts of the model specifications.

Economy

6.4 Engineering services are a significant proportion of the capital cost and a continuing charge on revenue budgets. The project design engineer should therefore ensure:

a. economy in provision, consistent with meeting the functional requirements and maintaining clinical standards;

b. optimum benefit from the total financial resources these services are likely to absorb during their lifetime.

6.5 Where alternative design solutions are available their consequential capital and revenue costs should be compared using option appraisal techniques[1]. In this way due consideration is given to the need for, and cost of, maintenance and the eventual replacement of plant and equipment.

6.6 Heat conversion and distribution losses can be significant where buildings are located remote from the development's energy centre. The economic appraisal of alternative locations and design solutions should take this factor into account.

6.7 In any new project, consideration should be given to energy management and facilities offered by a Whole Hospital control system.

6.8 In view of the increasing cost of energy, the project team should consider the economic viability of heat recovery from mechanical ventilation systems. Designers should also ensure that those services which use energy do so efficiently.

Maximum demands

6.9 User demand on engineering services is often difficult to predict, but experience indicates that services designed for simultaneous peak conditions are seldom fully utilised in practice. The estimated maximum demand, and storage requirement (where appropriate), for each engineering service in this accommodation, will need to be assessed individually to take account of the size and shape of the department, geographical location, operational policies and intensity of use. As a guide and for preliminary planning purposes only, the table below gives the estimated maximum demands for an 8-bed unit.

Service	Typical max. demand	Notes
Heating/ventilation/DHWS (kW)	90	
Domestic HWS (1/s)	1.8	720 litres storage (2 hours recovery)
Cold water (1/s)	2.6	4,000 litres storage (24-hour supply)
Supply ventilation (m^3/s)	2.26	
Extract ventilation (m^3/s)	2.34	Clean and dirty
Cooling (kW)	33	
Electrical (kVA)	12	Includes essential 6kVA
Medical gases (1/min)		
Oxygen	70	
Medical compressed air	300	
Vacuum	100	
Nitrous oxide	60	Project option. Anaesthetic gas scavenging (AGS) required

Space for plant and services

6.10 Space for plant and services should provide for:

a. easy and safe access, protected as far as possible from unauthorised entry;

b. frequent inspections and maintenance;

c. eventual removal and replacement of plant.

6.11 Recommended spatial requirements for mechanical, electrical and public health engineering services in health buildings is contained in Health Technical Memoranda (HTM) 23[2]. The information in this HTM is specifically intended for use during the initial planning stages when precise dimensional details of plant are not available.

6.12 The distribution of mechanical and electrical services to final points of use should, wherever possible, be concealed in walls and above ceilings. Heat emitters should be contained within a 200mm wide perimeter zone under window sills and critical dimensions should be taken from the boundary of this zone.

6.13 The 200mm zone includes the floor area occupied by minor vertical engineering ducts and is included in the building circulation allowance.

Access to control and isolation devices

6.14 Primary engineering distribution control and isolation devices should be:

a. located in circulation rather than working areas to avoid disruption of clinical work;

b. protected against unauthorised operation. For example, switchgear and fuse-boards should be housed in secure cupboards;

c. easily accessible for staff operation where appropriate.

Activity Data

6.15 Environmental and engineering technical data and equipment details are described in the Activity Data Sheets (see Chapter 8). They should be referred to for space temperatures, lighting levels, etc and when positioning equipment and outlets.

Safety

6.16 Section 6 of the Health and Safety at Work etc Act 1974[3] as amended by Schedule 3 of the Consumer Protection Act 1987[4], imposes statutory duties on all persons who design, manufacture, import, supply, install or erect "articles for use at work". One of the requirements of this section is to ensure, so far as is reasonably practicable, that the article is designed and constructed so that it will be safe and without risks to health at all times when it is being set, used, cleaned or maintained by a person at work. All parts of engineering systems are covered by the term "articles for use at work".

Fire precautions

6.17 The design of the engineering services should comply with the recommendations of Firecode which includes HTM 81[5], HTM 82[6] and HTM 83[7]. The engineer should also verify his proposals in accordance with the procedure described in paragraphs 3.15-3.16 of this Note.

6.18 Design guidance for fire precautions in new hospitals is contained in HTM 81[5]. Technical information concerning the design and specification of fire alarm and detection systems is contained in HTM 82[6]. This HTM replaces or modifies certain clauses of BS5839 Part 1[8] to meet the needs of health buildings. More general advice on fire safety in health care premises is contained in HTM 83[7].

Noise

6.19 Excessive noise in individual areas, whether internally or externally generated and transmitted, can adversely affect the operational efficiency of the unit and can cause discomfort. In this respect, the dirty utility area and bedpan disposal unit need particular attention. The limits and means of control advocated in Hospital Design Note 4[9], including its revisions[10] and the means of control given in Engineering Data Sheet DH1[11], should provide an acceptable acoustic environment.

6.20 There will also be a need to ensure speech privacy in office areas and at the staff base. Acceptable noise levels and, where applicable, any requirement for speech privacy in individual spaces are shown on the Activity Data A-Sheets.

Engineering commissioning

6.21 The engineering services should be commissioned in accordance with HTM 17[12]. This HTM also describes the requirements which should be included in the contract documents. Flow measurement and proportional balancing of air and water systems requires adequate test facilities, for example orifice plates, venturi valves, pitot tube tappings, etc, to be incorporated at the design stage.

Location of electrical and medical gas outlets

6.22 Electrical and medical gas outlets to each bed space should be provided from the ceiling (see paragraph 4.12). Numerous strategies have been reviewed, but only two provide unobstructed access to the patient. Each consists of equipment suspended from the building structure as follows:

a. continuous linear trunking running above and parallel to the bed head. It can accommodate a large number of electrical and gas outlets and it supports all equipment on a shelving system suspended underneath;

b. articulated arms similar to those found in an operating theatre. One arm supports small items of equipment, infusion pumps, etc. The other arm supports larger items of equipment, ventilators, etc. The two arms can accommodate a large number of electrical and medical gas outlets. Some installations utilise a third arm, particularly if dialysis equipment is required. It is relatively expensive and is therefore included as an optional service.

MECHANICAL SERVICES

Heating

6.23 General space heating requirements can usually be met by low pressure hot water radiators. They should be of the low surface temperature type and the system should be designed to ensure that the surface temperature does not exceed 43°C. Exposed hot water pipework, accessible to touch, should be insulated.

6.24 Radiators should normally be located under windows or against exposed walls, with sufficient clear space between the top of the radiator and the window sill to prevent curtains reducing the output. There should be adequate space below to allow cleaning machinery to be used. Where a radiator is located on an external wall, back insulation should be provided to reduce the rate of heat transmission through the building fabric.

6.25 Radiators may also be used to offset building fabric heat loss in mechanically ventilated spaces. Where, for example, a number of spaces are supplied from a common ventilation system, individual room temperature control may be achieved by using thermostatically controlled radiators.

6.26 All radiators should be fitted with thermostatic radiator valves. These should be of robust construction and selected to match the temperature and pressure characteristics of the heating system. The thermostatic head, incorporating a tamper-proof facility for presetting the maximum room temperature, should be controlled via a sensor located integrally or remotely as appropriate. To provide frost protection at its minimum setting, the valve should not remain closed below a fixed temperature.

6.27 Consideration should also be given to modulating the flow temperature to the heating appliances in accordance with the external ambient temperature.

Ventilation

General

6.28 Wherever possible, individual spaces should be naturally ventilated. Deep planned spaces may need mechanical ventilation. Planning should, therefore, seek to minimise the need for mechanical ventilation by ensuring that, wherever practicable, core areas are reserved for:

a. rooms that require mechanical ventilation for clinical or functional reasons, irrespective of whether their location is internal or peripheral, for example, sanitary facilities, dirty utility and beverage preparation areas;

b. spaces which have only transient occupation and, therefore, require little or no mechanical ventilation, for example, circulation and some storage areas.

6.29 Air movement induced by mechanical ventilation should be from clean to dirty areas where these can be defined. The design should allow for an adequate flow of air into any space having only mechanical extract ventilation, via transfer grilles in doors or walls. Such arrangements, however, should avoid the introduction of untempered air and should not prejudice the requirements of fire safety or privacy.

6.30 Fresh air should be introduced via a low velocity system and should be tempered and filtered before being distributed via high level outlets. Diffusers and grilles should be located to achieve uniform air distribution within the space, without causing discomfort to patients.

6.31 Ventilation supply plant should include air filters having a minimum arrestance of 85% when tested in accordance with BS6540, Part 1[13]. In urban or other areas of high atmospheric pollution, a higher standard of filtration may be economically justified to reduce the level of staining to internal finishes. Filters must be readily accessible for replacement and should be provided with a pressure-differential indicator.

6.32 The unit can be supplied from a multi-zone plant with separate ducts providing temperature control to each single bedroom and multi-bed area. Each single bedroom also requires humidity and adjustable temperature control. Ancillary areas can be ventilated by a tempered air supply from the same plant. The extract system can consist of a single unit and combined ductwork. It should discharge direct to atmosphere.

6.33 A separate extract system will be required for "dirty" areas, for example, utility and sanitary facilities. It should operate continuously throughout the day and night. A dual motor fan unit with an automatic changeover facility should be provided.

6.34 Ventilation of the unit as a whole should be considered in order to ensure that both supply and extract systems are in balance, taking due account of infiltration.

6.35 External discharge arrangements for extract systems should be protected against back pressure from adverse wind effects and should be located to avoid reintroduction of exhausted air into the building through air intakes and windows.

Multi-bed area

6.36 The multi-bed area should be mechanically ventilated and this should also include mechanical cooling.

Single-bed rooms

6.37 The mechanical ventilation system for single-bed rooms should be designed to provide "source and protective isolation", see paragraphs 2.14 and 4.15. A simple non-changeover system which provides balanced supply and extract ventilation to each single-bed room and gowning lobby is proposed. Such a "constant mode" system has a number of advantages and avoids the complications and reliability problems associated with changeover systems.

6.38 The gowning lobby, which functions as an airlock, will require a relatively high and balanced supply and extract air change rate to be effective against airborne organisms moving between circulation areas and single-bed rooms. For this reason, the gowning lobby should be relatively small.

6.39 Staff entering the gowning lobby from the corridor will go through a gowning and clinical hand-washing procedure and, during this period, the ventilation system will dilute the air entrained from the corridor. Further entrainment and dilution occurs as staff move from the gowning lobby to the single-bed room. The amount of air and number of organisms transferred from the corridor to the single-bed room through this process should be exceptionally low and will be inversely proportional to the time spent "gowning up". The reverse will also apply as staff leave the single-bed room.

6.40 The mechanical ventilation system should also include mechanical cooling and provide for a range of temperatures which can be adjusted by staff. The humidity within the single room should also be controlled.

Controls

6.41 The space temperature within the multi-bed and single-bed areas will usually be controlled by the mechanical ventilation heating and cooling system. The multi-bed design temperature should be centrally controlled, whereas single-bed rooms should have local temperature controls which are accessible to nursing staff. The single-bed room humidity should also be centrally controlled.

6.42 Supply and extract ventilation systems should include controls and indicator lamps in the plant room to confirm the operational status of each system. Alarms should be repeated in the works department. Their selection should take account of the extent to which they can be linked to, or provided by, a building management system serving the whole hospital.

Hot, cold and drinking water services

6.43 The requirements for the control of legionella bacteria in hot and cold water systems are set out in the DHSS Code of Practice[14].

6.44 Guidance on the design and installation of cold water supply pipework and distribution systems is contained in HTM 27[15]. For frost protection and to prevent condensation staining decorative finishes, all cold water pipework, valves, and flanges, should be insulated and vapour sealed.

6.45 The domestic hot water supply should be taken from the general hospital calorifier installation at a minimum outflow temperature of 60°C ± 2.5°C, and distributed to all outlets so that the return temperature at the calorifier is not less than 50°C. Outlet temperatures and fittings for sanitary equipment are shown on Activity Data Sheets. (See also Health Guidance Note – '"Safe" hot water and surface temperatures'[16].)

Dialysis

6.46 Water and drainage should be piped to each of the single-bed rooms and two-bed spaces in the multi-bed area for haemodialysis equipment. (See paragraph 4.17.)

6.47 The quality of the water for haemodialysis should comply with ISO/TC 150/SC 2/WG5[17] – 'Renal Replacement, Detoxification and Apheresis' (currently in draft).

6.48 Water treatment normally consists of water softening, particle filters and reverse osmosis.

6.49 Where there are a small number of dialysis machines, as in this department, it is more economical to supply potable water to small water treatment units in the bed space.

Piped medical gases

6.50 Piped medical gases to each bed should be located as described in paragraph 6.22 and will normally include oxygen, medical compressed air and vacuum. Optionally, nitrous oxide and anaesthetic gas scavenging (AGS) may also be provided. Services to the bed space should be duplicated in the equipment service room. Further guidance is contained in HTM 22[18].

ELECTRICAL SERVICES

6.51 The installations should comply in all respects with the current IEE Regulations for Electrical Installations[19] and conform to the requirements of HTM 7[20].

6.52 The point of entry for the electrical supply will be a switchcupboard housing the main isolators and distribution equipment. This space will also be the distribution centre for subsidiary electrical services. Switchgear should be lockable "in the off position". Wherever possible, all equipment should be mounted at a height to give easy access from a standing position.

Electrical installation

6.53 The electrical installation in occupied areas should be concealed using PVC insulated cable in screwed steel conduit or trunking but, in certain circumstances, mineral insulated metal sheathed cables may be necessary. Steel conduit and trunking wireways for communication and data systems should also be concealed wherever possible.

Electrical interference

6.54 Guidance concerning the avoidance and abatement of electrical interference is contained in HTM 14[21]. Fluorescent luminaires should comply with BS5394[22].

6.55 Care should be taken to avoid mains-borne interference and electrical radio frequency interference affecting physiological monitoring equipment, computers or other electronic equipment used here or elsewhere on the hospital site.

Lighting

6.56 Practical methods of lighting the various functional spaces are contained in the CIBSE Lighting Guide LG2[23]. Luminaires should be manufactured and tested in accordance with the requirements specified in the relevant sections of BS4533[24]. Their location should afford ready access for lamp changing and maintenance, but with the overriding requirement that the recommended standard of illuminance is provided to the task area.

6.57 Colour finishes and lighting throughout circulation areas should be co-ordinated to create a calm and welcoming atmosphere.

6.58 Architects and engineers should collaborate to ensure that decorative finishes are compatible with the colour rendering properties of the lamp and the spectral distribution of the light source is not adversely affected.

6.59 Each bed should be illuminated by luminaires located above or behind the bedhead. The luminaires should be controlled by dimmer switches capable of providing appropriate illuminance at all times. (See also paragraph 3.21.)

6.60 Additional luminaires should be provided within the general circulation space of the multi-bed area and these should also be controlled by dimmer switches.

6.61 Local luminaires, controlled by dimmer switches, should be provided at the staff base.

6.62 Fluorescent lighting should be selected from one of the recommended types of lamp having suitable colour rendering characteristics. Generally, luminaires should be fitted with fluorescent lamps. But intermittently and infrequently used luminaires may be fitted with compact fluorescent or incandescent lamps.

6.63 The lighting of corridors and other circulation areas, which generally are areas not covered by Activity Data Sheets, should be in accordance with the guidance contained in HBN40 – 'Common activity spaces; Volume 2 – Corridors'[25].

6.64 Safety lighting in accordance with HTM 11[26] and BS5266[27] should be provided on primary escape routes.

6.65 Where visual display terminals are to be used, the lighting should be designed to avoid bright reflections on the screen and to ensure that the contents of the screen are legible. Further guidance is contained in the CIBSE Lighting Guide LG3[28].

Controlled Drugs cupboard

6.66 In compliance with HC(77)16 (in Wales, WHN(77) 32)[29] a red indicating lamp should be provided on each Controlled Drugs cupboard. Repeat indicating lamps, where appropriate, should be fitted outside the doorway to the room in which the cupboard is located and at the corresponding staff base. All lamps should be interlocked with the cupboard to give visual indication when the cupboard is unlocked. An indicating lamp denoting that the circuit is energised should be fitted to each cupboard.

6.67 The circuits for all these indicating lamps should be derived from the essential supply. For further information see HTM 63[30] and its associated specification for electrical services. The cupboards should be in accordance with BS2881[31].

Socket-outlets and power connections

6.68 Socket-outlets in each bed space should be located as described in paragraph 6.22 and supplied from at least two separately fused circuits of common phase.

6.69 Sufficient 13 amp switched, shuttered socket-outlets, connected to ring or radial circuits, should be provided to supply all portable appliances likely to be used simultaneously. The installation of twin outlets should be considered where activities occur in juxtaposition.

6.70 To enable domestic cleaning appliances, with flexible leads nine metres long, to operate over the whole of the department, switched socket-outlets should be provided in corridors and in individual rooms where considered necessary.

6.71 Appliances requiring a three-phase supply or those rated in excess of 13 amp single phase should be permanently connected to separate final subcircuits fed from the distribution board and independently switched at a local isolator of appropriate fused rating. Fixed appliances of less than 13 amp rating should be permanently connected to a double pole switched 13 amp spur outlet with indicating light and suitably fused for the appliance rating. These spur outlets may form part of a ring circuit. Isolation switches should be provided adjacent to all engineering plant and equipment for use by maintenance staff.

6.72 Heating appliances and automatic equipment should have indicator lights to show when they are energised. Indicators should be incorporated in the control panel of the apparatus, in the control switch or in the socket-outlet from which the apparatus derives its supply.

6.73 The electrical supply connections to electro-medical equipment should comply with BS5724[32].

Socket-outlets for minor scheduled servicing of medical equipment

6.74 Socket-outlets for user servicing of medical equipment, see HEI 98[33], within a designated area of the equipment service room may also be used by a visiting EME technician to carry out minor scheduled servicing. The layout within the designated area should, therefore, ensure that no adventitiously earthed metallic structure, such as radiators or pipes, is within easy reach of the operator sitting at the bench. The floor within this area should be covered with a rubber mat.

6.75 Shuttered socket-outlets should be connected via an emergency trip. This circuit should be protected by a core balance earth leakage protective device having a nominal tripping current not exceeding 15mA and complying with the requirements of BS4293[34]. In addition, a master emergency trip should be provided outside the entrance to the room. A shrouded earth terminal should also be provided at one end of the bench. The socket-outlets should be mounted in plastic trunking and all metallic fixings should be isolated from earth.

6.76 A plastic chain and stanchion or equivalent should be available to enclose the designated area when the visiting technician is carrying out "live working procedures". Socket-outlets, outside this area, should have a notice warning that earth leakage protection is not provided.

Emergency electrical supplies

6.77 Guidance on emergency electricity supplies is contained in HTM 11[26].

6.78 Socket-outlets connected to "essential circuits" will include those at the bedhead and at the staff base. The supply to the Controlled Drugs cupboard should also be from an "essential circuit".

6.79 All communication, clock and alarm systems should be supplied from "essential circuits".

Entrance door security system

6.80 A door security intercommunication system is required between the staff base and entrance to the ward to prevent unauthorised entry, whilst permitting free movement of staff. The system should provide for verbal communication with, and an electro-magnetically operated door lock to be controlled from, the staff base.

6.81 An override, located inside the entrance, is required to provide staff with a convenient exit route for normal work or in the event of fire. The lock should disengage on initiation of the fire alarm system.

Staff/staff call systems

6.82 A visual and audible indication of operation should be provided to give responding staff unambiguous identification of the call source. Further guidance on staff/staff call systems is contained in HTM 15[35] and in Engineering Data Sheet DU 3.1[36].

Staff location and emergency systems

6.83 A separate pull-push switch should be located at each bedhead to initiate special emergency (CRASH) group call arrangements to predetermined receivers. These pull-push switches should form part of the staff/staff call system and should override existing calls on the system. The emergency group call system should interface with the paging system to ensure automatic paging of predetermined receivers without involving the telephone operator. The interface module (emergency call to the paging system) should be located in the department's switchcupboard and should be hand wired to the paging system decoder(s) located in the telephone operator's room. Further guidance on staff location and emergency systems is contained in HTM 20[37] and HBN 48[38].

Telephone wiring

6.84 The hospital telephone system should be extended to serve this unit in accordance with the requirements shown on the Activity Data Sheets. Wiring should terminate at each extension point in a standard line jack unit.

6.85 Telephones should be fitted with muting switches and visual indicators.

6.86 Outlets should be provided for fixed payphones for the use of staff and visitors. The handset of payphones should be fitted with an inductive coupler to assist people using a hearing aid.

6.87 Guidance concerning the provision of telephone services, including the telephone internal cabling distribution and telephone handsets, is contained in HBN 48[38].

Wireways

Data links

6.88 Wireways for data links should be provided between this department and the main hospital data management system (see paragraph 5.15). Normally, the cables can be accommodated in the extra low voltage compartment provided for other systems and, therefore, there should be no need to make extra provision.

Physiological monitoring equipment

6.89 Wireways for automated physiological monitoring should be provided to each bed space and staff base (see paragraph 2.38). A separate conduit/trunking network is required to avoid electrical interference.

Electric clocks

6.90 Synchronous clocks with sweep second hands should be provided where indicated on the Activity Data Sheets.

Radio and television

6.91 If a radio or television system is required, it should be supplied from the communal hospital installation equipment.

Lightning protection

6.92 Protection of the hospital building against lightning should be provided in accordance with HTM 7[20], HSE Data Sheet DB 2[39] and BS6651[40].

INTERNAL DRAINAGE

6.93 The primary objective is to provide an internal drainage system which uses the minimum of pipework and remains water- and air-tight at joints and connections, but is sufficiently ventilated to retain the integrity of water seals.

Design parameters

6.94 General design guidance is contained in the relevant British Standards and Codes of Practice, including BS5572[41], and the current Building Regulations. Recommendations regarding spatial and access requirements for public health engineering services are contained in HSE Data Sheet EA5[42].

6.95 The gradient of branch drains should be uniform and adequate to convey the maximum discharge to the stack without blockage. Practical considerations such as available angles of bends/junctions and their assembly, as well as space considerations, usually limit the minimum gradient to about 1:50 (20mm/m). For larger pipes, for example, 100mm diameter, the gradient may be less, but they will require workmanship of a high standard if adequate self-cleansing flow is to be maintained. It is not envisaged that pipes larger than 100mm diameter will be required within inter-floor or ground floor systems serving this unit.

6.96 Provision for inspection and maintenance should afford "full-bore" access and should be located, where possible, outside clinical areas.

Operational considerations

6.97 Maintenance problems may arise as a result of misuse of the system, for example, disposal of paper towels down WCs. Appropriate disposal facilities, therefore, should be provided. Warm-air hand dryers can mitigate the problem.

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7.0 Cost information

Introduction

7.1 For all types of health buildings it is important that building costs and revenue expenditure are kept as low as possible, consistent with acceptable standards. Within this general context, Building Notes provide a synopsis of accommodation for health buildings which the Department of Health, in conjunction with the National Health Service, recommends for the provision of a given service.

Works cost

7.2 To prepare an estimate of the works cost for a scheme, reference should be made to the Capricode Health Building Procedures Manual (Chapter 1, Stage 1, Annex 1c). The total cost allowance for a scheme is derived by aggregating the cost of the functional units, Essential Complementary Accommodation (ECA) and Optional Accommodation and Services (OAS) as appropriate to the particular scheme.

7.3 The cost allowances cover the building and engineering requirements set out in this Note. In costing the functional units it has been assumed that the intensive therapy unit (ITU) will be incorporated into a District General Hospital where the common use of services will be available.

Functional unit

7.4 The functional unit for this Note is the "bed". Three sizes of department have been costed; 6, 8 and 10 beds. The activity spaces and areas used for costing the functional units are listed in the Schedules of Accommodation at the end of this chapter.

Essential Complementary Accommodation

7.5 This comprises activity spaces which are essential to the running of the ITU, but which in certain circumstances may be available in a convenient location elsewhere in the hospital. The ECA costed in this Note is listed in the Schedules of Accommodation at the end of this chapter.

Optional Accommodation and Services

7.6 This Note, where appropriate, draws attention to alternative ways of providing services or facilities, including the likely cost implications. This information will enable project teams to select the solution which is most suitable to their needs. The OAS costed in this Note is listed in the Schedules of Accommodation at the end of this chapter.

Dimensions and areas

7.7 In determining spatial requirements, the essential factor is not the total area provided but the critical dimensions, that is those dimensions critical to the efficient functioning of the activities which is are to be carried out. To assist project teams in preparing detailed design solutions for the rooms and spaces, studies have been carried out to establish dimensional requirements in the form of critical dimensions. The results of these studies appear as ergonomic diagrams in Appendix 1 of this Note and in Health Building Note 40 – 'Common Activity Spaces'.

7.8 For development planning and at the earliest stage of a design it may be convenient for designers to have data available which will enable them to make an approximate assessment of the sizes involved. For this reason the areas prepared for the purpose of establishing the cost allowances are included at the end of this chapter.

7.9 It is emphasised that the areas published **do not** represent recommended sizes, nor are they to be regarded in any way as specific individual entitlements.

Circulation

7.10 Space for circulation, which includes allowances for planning provision, an engineering zone adjacent to the external walls, small vertical ducts and partitions, is shown in the Schedules of Accommodation at the end of this chapter and is included in the cost allowances.

Communications

7.11 Staircases, lifts and plant rooms, with the exception of an electrical switchroom, are not included in the cost allowances.

Engineering services

7.12 The engineering services as described in Chapter 6, and exemplified in the Activity Data, are included in the cost allowance.

7.13 Primary engineering services are assumed to be conveniently available at the boundary of the department but the cost allowance does include a share of the central refrigeration plant and distribution system. The cost allowance also includes for the ventilation plant and distribution system.

7.14 The mechanical installation includes:

a. heating;

b. ventilation;

c. mechanical cooling;

d. hot and cold water (including supply and drainage for dialysis);

e. fire main;

f. medical gases.

7.15 The electrical installation includes:

a. main intake switchgear, local isolators and distribution boards;

b. lighting;

c. power (including supplies to ventilation plant);

d. earth bonding of extraneous metal work;

e. telephone wiring (excluding handsets);

f. wireways for data links;

g. wireways for physiological monitoring equipment;

h. clocks;

j. fire and alarm systems;

k. staff/staff call systems;

m. staff location and emergency system.

Equipment

7.16 The following group 1 equipment is included in the cost allowance:

a. Controlled Drugs cupboard;

b. services trunking systems for eight bedheads as described in paragraph 6.22(a).

Schedules of Accommodation

Para. no.	Activity Space	Space area sq. m.	6 beds Qty.	6 beds Total area sq. m.	8 beds Qty.	8 beds Total area sq. m.	10 beds Qty.	10 beds Total area sq. m.
4.9	Waiting area	–	1.0	4.50	1.0	7.00	1.0	9.00
4.10	Staff base	17.00	1.0	17.00	1.0	17.00	1.0	17.00
4.14	Single-bed room	25.50	2.0	51.00	2.0	51.00	2.0	51.00
4.14	Gowning lobby	7.00	2.0	14.00	2.0	14.00	2.0	14.00
4.18	Multi-bed area	20.00	4.0	80.00	6.0	120.00	8.0	160.00
4.32	Bulk supplies store	18.00	1.0	18.00	1.0	18.00	1.0	18.00
4.32	Holding bay	8.50	1.0	8.50	1.0	8.50	1.0	8.50
4.23	Clean utility	17.00	1.0	17.00	1.0	17.00	1.0	17.00
4.24	Dirty utility	12.00	1.0	12.00	1.0	12.00	1.0	12.00
4.29	Disposal hold	4.50	1.0	4.50	1.0	4.50	1.0	4.50
4.33	Linen bay	4.00	1.0	4.00	1.0	4.00	1.0	4.00
4.36	Clinical equipment store	33.00	1.0	33.00	1.0	33.00	1.0	33.00
4.34	Mobile X-ray equipment bay	4.50	1.0	4.50	1.0	4.50	1.0	4.50
4.35	Furniture store	15.00	1.0	15.00	1.0	15.00	1.0	15.00
4.38	Laboratory	7.50	1.0	7.50	1.0	7.50	1.0	7.50
4.37	Equipment service room	10.00	1.0	10.00	1.0	10.00	1.0	10.00
4.37	Equipment service room lobby	10.50	1.0	10.50	1.0	10.50	1.0	10.50
4.39	Staff changing: male	–	1.0	7.50	1.0	7.50	1.0	8.50
4.39	Staff changing: female	–	1.0	15.50	1.0	15.50	1.0	17.50
4.39	Staff shower	2.50	2.0	5.00	2.0	5.00	2.0	5.00
4.39	Staff WC	2.00	2.0	4.00	2.0	4.00	2.0	4.00
4.41	Staff rest room	–	1.0	21.00	1.0	21.00	1.0	28.00
4.41	Staff pantry	6.50	1.0	6.50	1.0	6.50	1.0	6.50
4.43	Patients' pantry	6.50	1.0	6.50	1.0	6.50	1.0	6.50
4.45	Relatives' sitting room	11.50	1.0	11.50	1.0	11.50	1.0	11.50
4.45	Relatives' pantry	6.50	1.0	6.50	1.0	6.50	1.0	6.50
4.45	Relatives' WC	2.00	1.0	2.00	1.0	2.00	1.0	2.00
4.47	Office	10.00	1.0	10.00	1.0	10.00	1.0	10.00
4.44	Office/on-call room	10.00	1.0	10.00	1.0	10.00	1.0	10.00
4.44	Ensuite WC and shower	6.00	1.0	6.00	1.0	6.00	1.0	6.00
4.47	Office (2 person)	11.50	1.0	11.50	1.0	11.50	1.0	11.50
4.48	Seminar room	19.00	1.0	19.00	1.0	19.00	1.0	19.00
4.49	Cleaners' room	7.00	1.0	7.00	1.0	7.00	1.0	7.00
4.50	Switchcupboard	2.00	1.0	2.00	1.0	2.00	1.0	2.00
	Nett total			462.50		505.00		557.00
	Circulation, etc			231.50		253.00		279.00
	Totals			**694.00**		**758.00**		**836.00**
	Departmental areas			695 sq.m.		760 sq.m.		835 sq.m.

Essential Complementary Accommodation

Para. no.	Activity Space	Space area sq.m.	Circn. etc sq.m.	Total area sq.m.
4.45	Relatives' overnight stay	10.50	5.50	16.00
4.45	Relatives' shower	2.50	1.50	4.00

Optional Accommodation and Services

Para. no.	Activity Space	Space area sq.m.	Circn. etc sq.m.	Total area sq.m.
4.52	Assisted patients' treatment bathroom with WC	15.50	8.00	23.50
6.22	Extra for ceiling mounted articulated arm delivery system	No additional area required		

8.0 Activity Data

8.1 "Activity DataBase" is an information system developed to help project and design teams by defining the users' needs more precisely. This information constitutes the computerised Activity DataBase, first issued to health authorities in England and to the health departments in Scotland, Northern Ireland and Wales in 1989 and subsequently up-dated twice yearly. It comprises three types of information sheet: Activity Space Data Sheets (known as A-Sheets), their supporting Activity Unit Data Sheets (B-Sheets) and A-Sheet component listings (D-Sheets).

8.2 A-Sheets record, in more detail than is described in this Note, each task or activity that is performed in a particular activity space (which may be a room, space, corridor or bay) together with environmental conditions and the technical data necessary to enable the activities to be performed. Each A-Sheet also contains a list of the titles and code numbers of the associated B-Sheets.

8.3 B-Sheets provide narrative text and graphics to scale relating to one activity. They show equipment fitted or supplied as part of the building and the necessary engineering terminals. There are also "component B-Sheets" which show a range of particular components rather than an activity.

8.4 D-Sheets provide information about the total quantities of components extracted from all B-Sheets selected for inclusion in an individual A-Sheet, or series of A-Sheets contained within a health building department.

8.5 Activity Data is only available in the form of magnetic media, but this may be used to generate paper copies where required.

8.6 Further information about the use and preparation of Activity Data can be found in the 'Guide to "A" and "B" Activity Data Sheets and their use in Health Building Schemes' issued to health authorities with EL9(89)MB/19 (in Wales, WHC(89)18). Health authorities may obtain additional copies of the Guide from NHS Estates, Department of Health, Room 413A, Euston Tower, 286 Euston Road, London NW1 3DN.

Activity Data applicable to this Note

8.7 The A-Sheets recommended for the activity spaces described in this Note are either new or amended or have been selected from existing sheets. A list of A-Sheet code numbers and titles is given at the end of this chapter.

8.8 Further Activity Data Sheets may be selected, modified or created by project teams to their own requirements, for any services not described in the Note or included in the list. Members of project teams are advised to contact their Activity Data Co-ordinator/Welsh Office for information and advice about the selection of Activity Data, at an early planning stage.

8.9 In order to ensure consistent and economic provision, variations from the A-Sheets recommended for the spaces covered in this Note should be considered only where it has been decided that the function of a space will differ substantially from that described.

List of Activity Data A-Sheets

Note: The Activity Data A-Sheets listed below may not carry a title identical to the activity spaces detailed in this Note. Use of the appropriate A-Sheet code number will result in the correct activity space being accessed.

Activity Space	A-Sheet Code no.	Para. no. in HBN
Entrance/waiting area	J0101	4.9
Staff base	T0103	4.10
Gowning lobby	G0510	4.15
Single-bed room	B1601	4.14-4.17
Multi-bed area (6 beds)	B1606	4.18-4.20
Clean utility	T0513	4.23
Dirty utility	Y0303	4.24-4.28
Disposal hold	Y0603	4.29-4.31
Supplies holding bay	G0122	4.32
Bulk supplies store	W0503	4.32
Linen bay	G0118	4.33
Mobile X-ray equipment bay	G0116	4.34
Furniture store	W1561	4.35
Clinical equipment store	W1503	4.36
Equipment lobby	G0511	4.37
Equipment service room	L1801	4.37
Laboratory	L1305	4.38
Staff changing: 10 persons	V0516	4.39-4.40
Staff changing: 30 persons	V0517	4.39-4.40
Shower	V0801	4.40
Staff washroom/WC	V1005	4.40
Staff rest room: 15 persons	D0512	4.41-4.42
Beverage bay	P0705	4.42
Pantry: patients up to 10	P0614	4.43
Store: equipment, office on-call area 2.10sq.m.	W1558	4.44
Duty room: overnight stay	M0902	4.44
Office: medical	M0315	4.44&4.47
Washroom/WC/Shower	V1316	4.44
Day/overnight room: visitors	D1505	4.45-4.46
Sitting room: visitors	D1403	4.45-4.46
Office: all disciplines	M0212	4.47
Seminar room: 10 persons	H0519	4.48
Store, seminar room equipment	W0908	4.48
Cleaners' room	Y1202	4.49
Switchcupboard	K0101	4.50
Single-bed room: articulated arm delivery system	B1602	4.14-4.17
Clinical equipment store with Hansporter for articulated arm system	W1502	4.36
Washroom/WC and shower	V1301	4.44-4.46
Bathroom/WC/Wash: treatment assisted patient. Suitable for stretcher hoist, mobile	V1712	4.52

Appendix 1

Critical dimensions

Introduction

1. Critical dimensions are those dimensions which are critical to the efficient functioning of an activity; thus the size of components, their position and the space around them may all be critical to the task being performed. Guidance on these dimensions for a particular activity is provided in the form of **component-user data sheets**. These illustrate components, that is equipment, furniture and fittings, and provide ergonomic data on the space required for users to move, operate or otherwise use the component; information about the component, for example fixing heights, and the users, for example reach, is also provided. Component-user data sheets thus complement the information given on Activity Data B-Sheets (see Chapter 8).

2. This appendix contains sheets relevant to this Note. In addition, ergonomic data common to the design of a number of departments is contained in Health Building Note 40 – 'Common Activity Spaces', to which reference should also be made.

Component dimensions

3. These relate to the size and position of components as follows:

a. sizes of components are shown thus

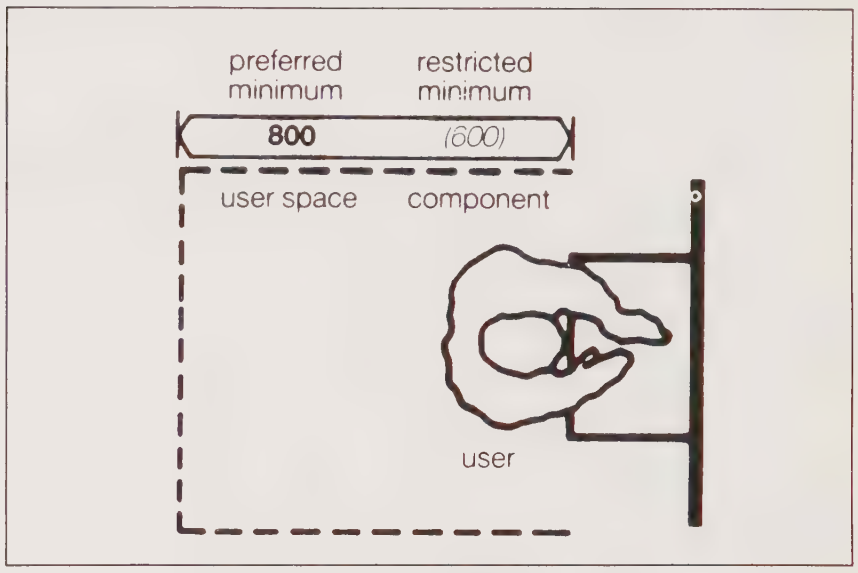
b. preferred component fixing heights are shown as height above floor level thus

1000
1000-1300

(In some cases an acceptable range of fixing heights is also given in italics.)

Activity dimensions

4. Activity dimensions define the user space, which is the minimum space required to perform an activity. Two types of activity dimensions are given:

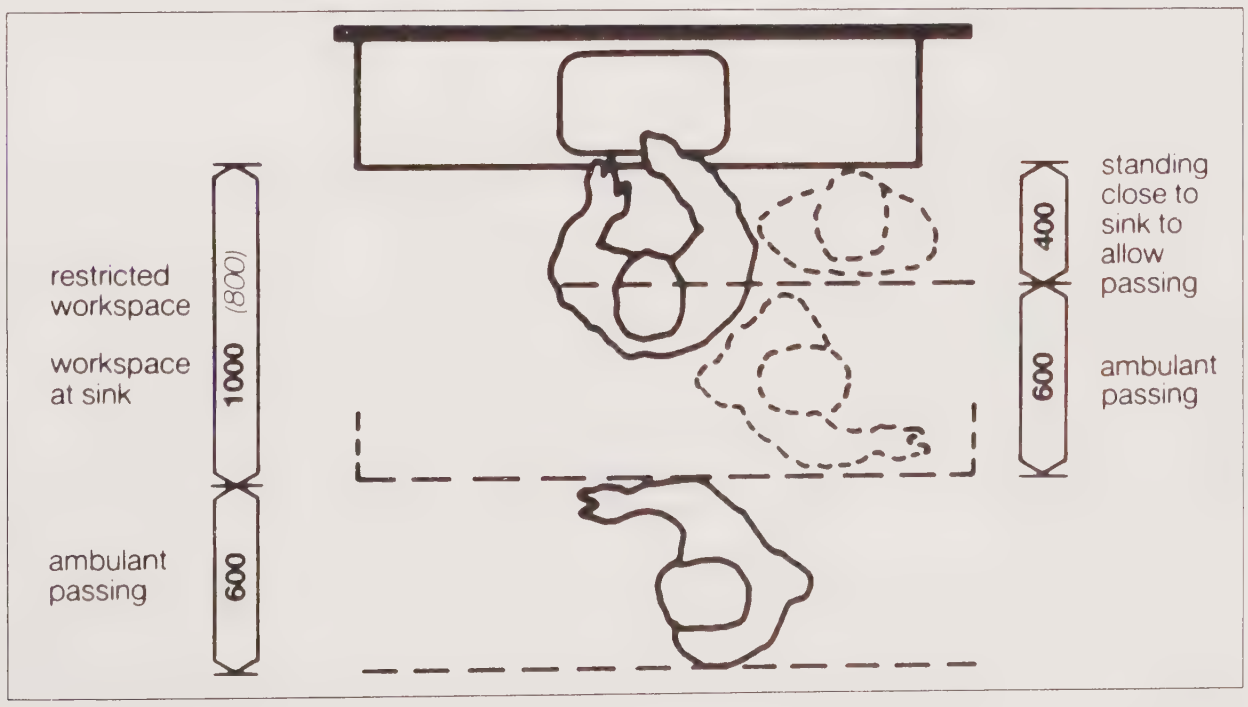


a. preferred minimum – this defines the minimum space required to carry out an activity efficiently and is shown in bold type.

b. restricted minimum – this will only allow the activity to be performed at the expense of the user experiencing some difficulty. It is not recommended for general application but may be appropriate when considering the overlapping that can be allowed when two user spaces are adjoining.

Selection of activity dimensions

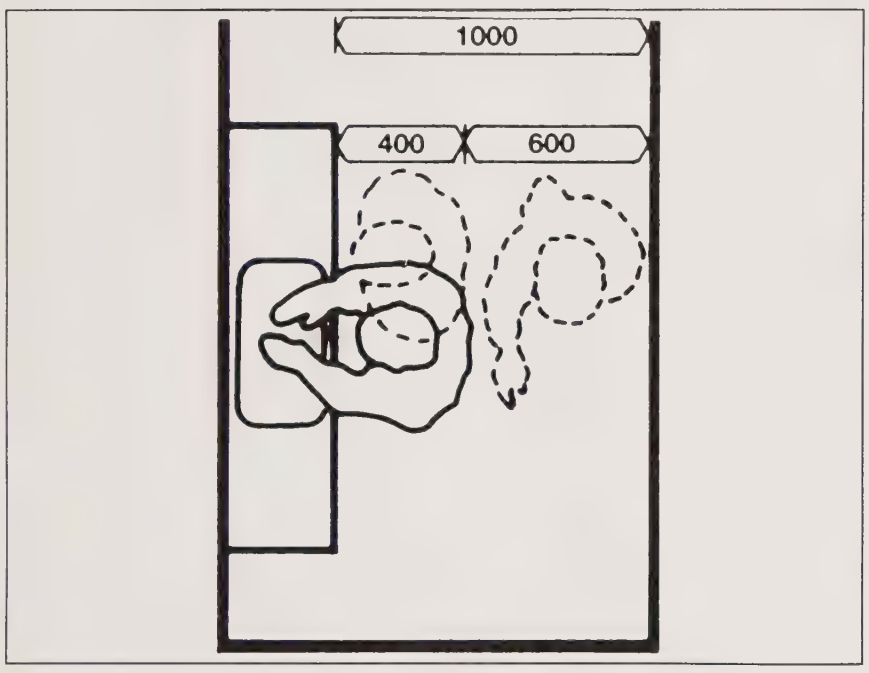
5. When using component-user data sheets to design activity space layouts, selection of the appropriate activity dimensions is essential for economy and efficiency. Selection should be based on careful consideration of the frequency, duration, timing and importance of the activities and also the number of people involved. A typical example of the use of a sink showing activity dimensions provided by the component user data sheet is shown below.



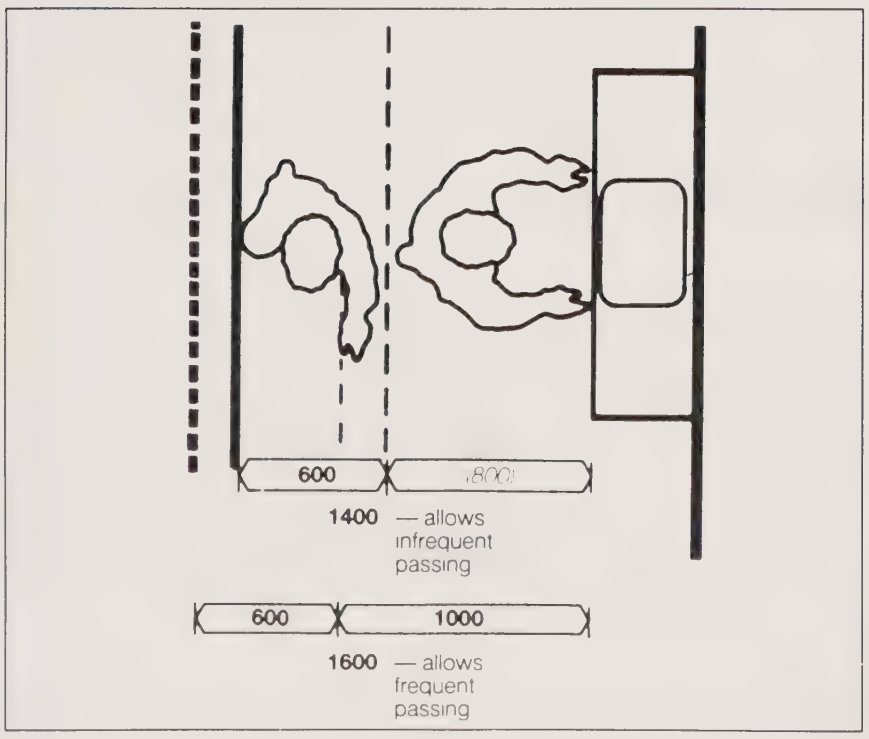
Examples

6. The following worked examples show the sink being used in three different situations and show how the appropriate dimensions would be selected but do not necessarily relate to this particular building guidance. These examples have been simplified and additional factors such as the movement of mobile equipment may also be critical.

a. if the room is normally occupied by one person only the 1,000 workspace dimension may be applicable. An (800) restricted dimension should not be used as this dimension is only applicable where two user spaces are adjoining, not where an individual user space is bounded by a wall or solid obstruction. If the person using the sink stops work and stands close to the sink, 1,000 is also sufficient space to allow a second person to pass, that is 600 + 400.

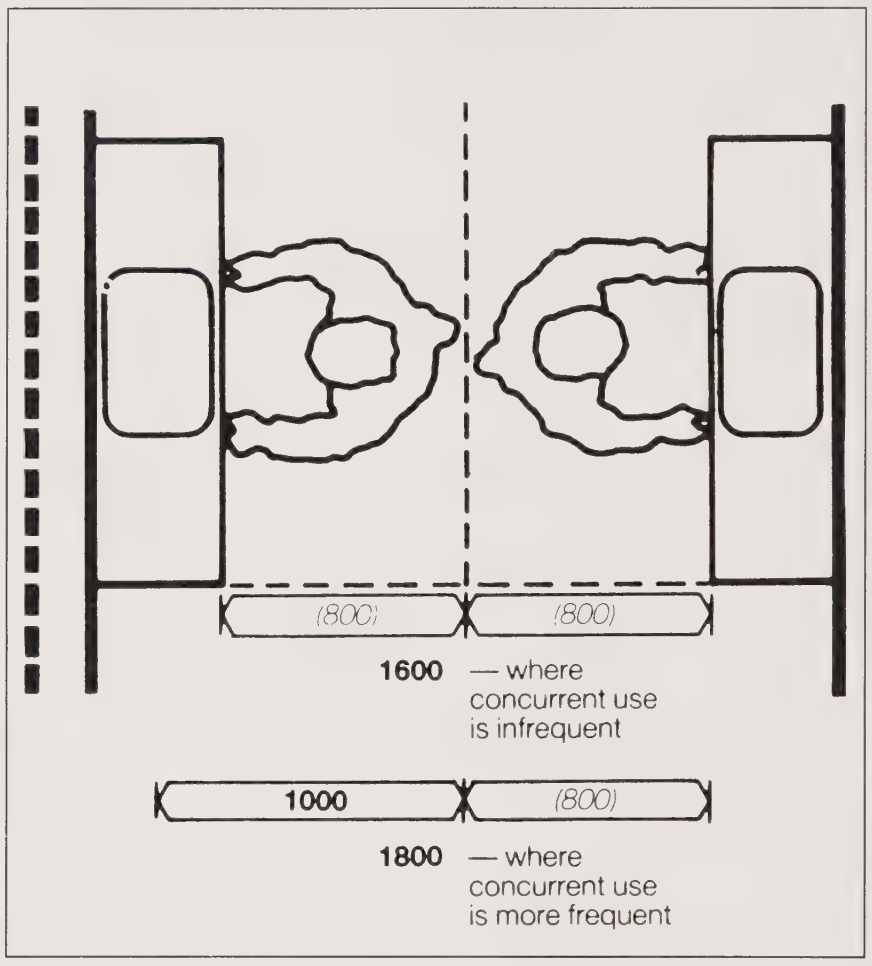


b. if space is required to allow a person to pass, without the user of the sink stopping work, then the 600 passing dimension is added to the workspace dimension. If passing is infrequent then temporary restriction of the sink user's space may be acceptable; this gives an overall dimension of 600 + (800) = 1,400. If passing is frequent and restriction of the sink user's space is not acceptable the overall dimension is 600 + 1,000 = 1,600.



c. where space has to be provided to enable two sinks to be used concurrently the overall dimension between sinks will be the sum of the workspace dimensions, for example if concurrent use is infrequent and of short duration then (800) + (800) = 1,600 may be acceptable. Alternatively 1,000 + (800) = 1,800 allows the full workspace for one sink user and restricted space for the second user, where concurrent use of the sinks is more frequent.

Note. The passing of a third person between the two sink users may also be critical in this example. Where the sinks are staggered 1,400 may be acceptable as in example (b).



List of ergonomic drawings

1a. Bed space: fixed beam service delivery system
1b. Bed space: fixed beam service delivery system
2a. Bed space: double arm double pivot point service delivery system
2b. Bed space: double arm double pivot point service delivery system
2c. Bed space: double arm double pivot point service delivery system
3. Staff base
4. Clean utility
5. Clinical equipment store and workshop
6. Bulk store
7. Laboratory

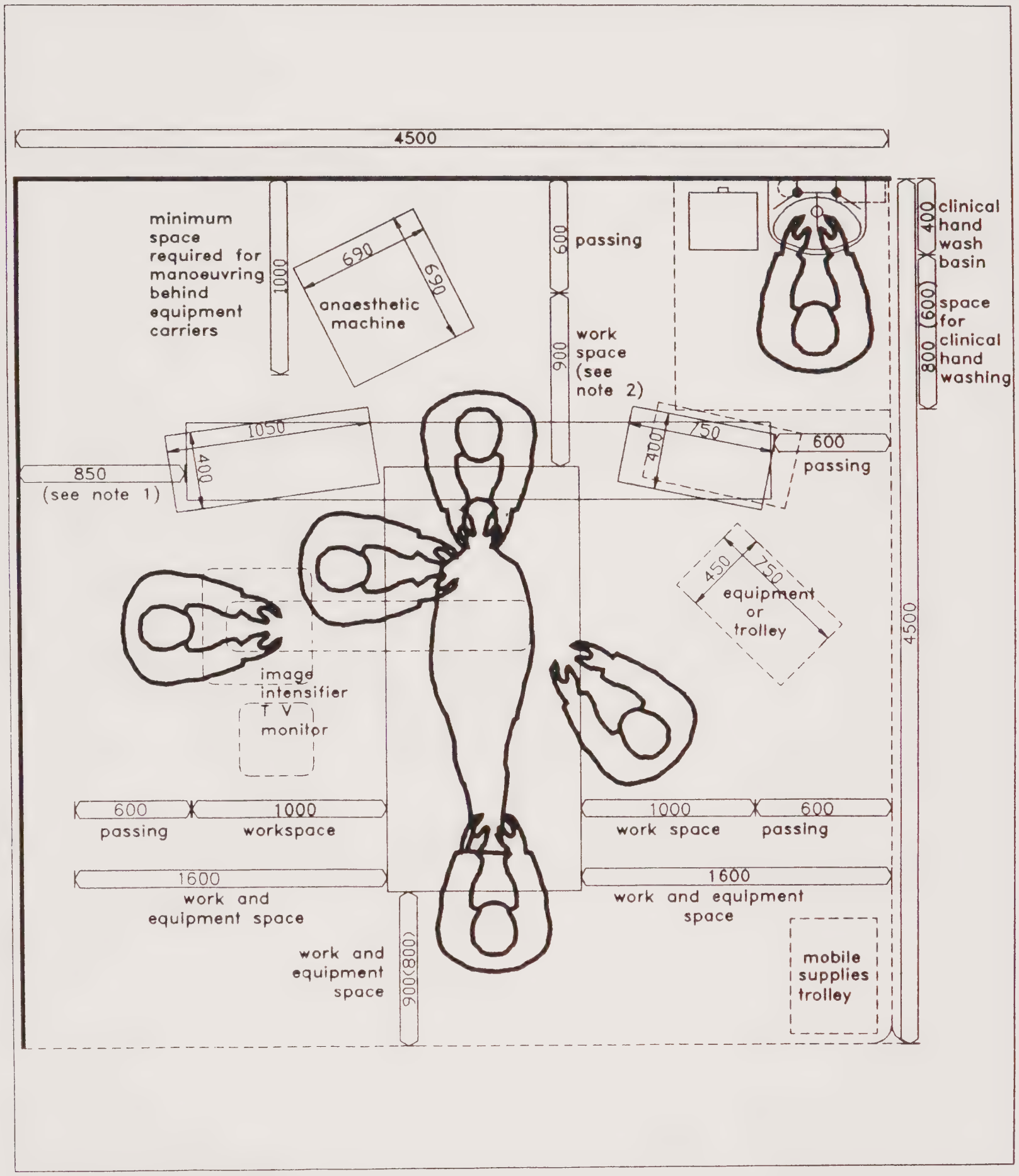
Activities
Accommodating a patient needing continuous medical and nursing care using piped medical gases, vacuum and life-support equipment.

Medical and nursing procedures require all round access to the patient

Ergonomic data sheet, not to scale

Bed space (1a)

Demonstrating the space requirements of a fixed beam service delivery system



1500 (1400)

preferred minimum — restricted minimum (recommended only in limited circumstances: see explanatory notes)

1. This space should not be reduced since access is required for staff and equipment at the patient's head.

2. This space should not be reduced since space is required to work at the head of the patient and to park equipment.

3. The mobile trolley is intended to hold specific items needed by the patient for a 12–24 hour period including sterile supplies and emergency drugs.

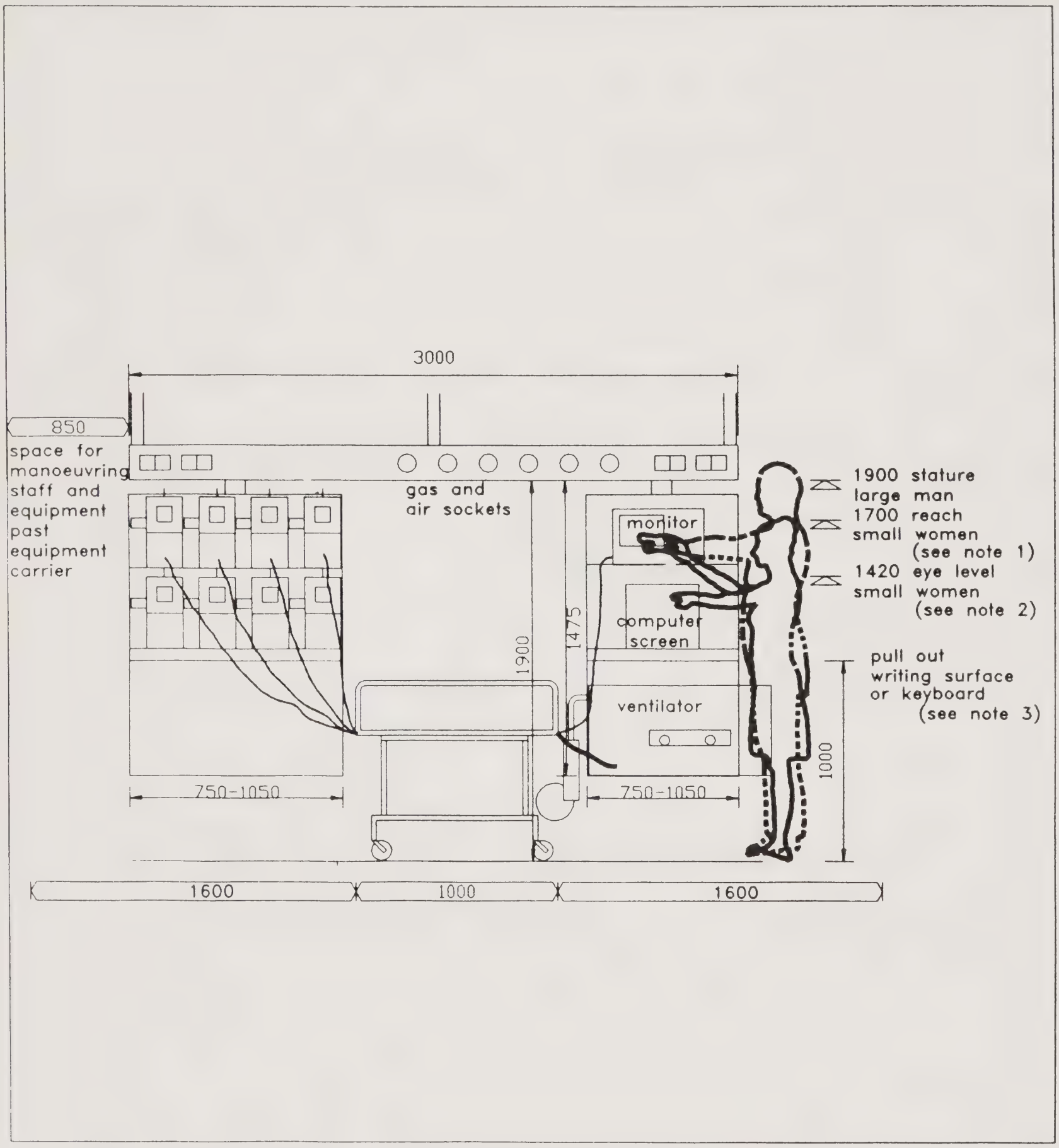
Activities
Accommodating a patient needing continuous medical and nursing care using piped medical gases, vacuum and life-support equipment.

Medical and nursing procedures require all round access to the patient

Ergonomic data sheet, not to scale

Bed space (1b)

Demonstrating the space requirements of a fixed beam service delivery system



1500 (1400)
preferred minimum
restricted minimum (recommended only in limited circumstances see explanatory notes)

Notes
1. There is a conflict in safety, the rail is at head height of a tall man but short women will find it very difficult to reach the sockets.
2. The height of the monitor is satisfactory since it will not be viewed by standing directly in front of it but from the foot of or the opposite side of the bed.
3. This height is satisfactory for occasional short duration writing of notes or using the keyboard whilst standing

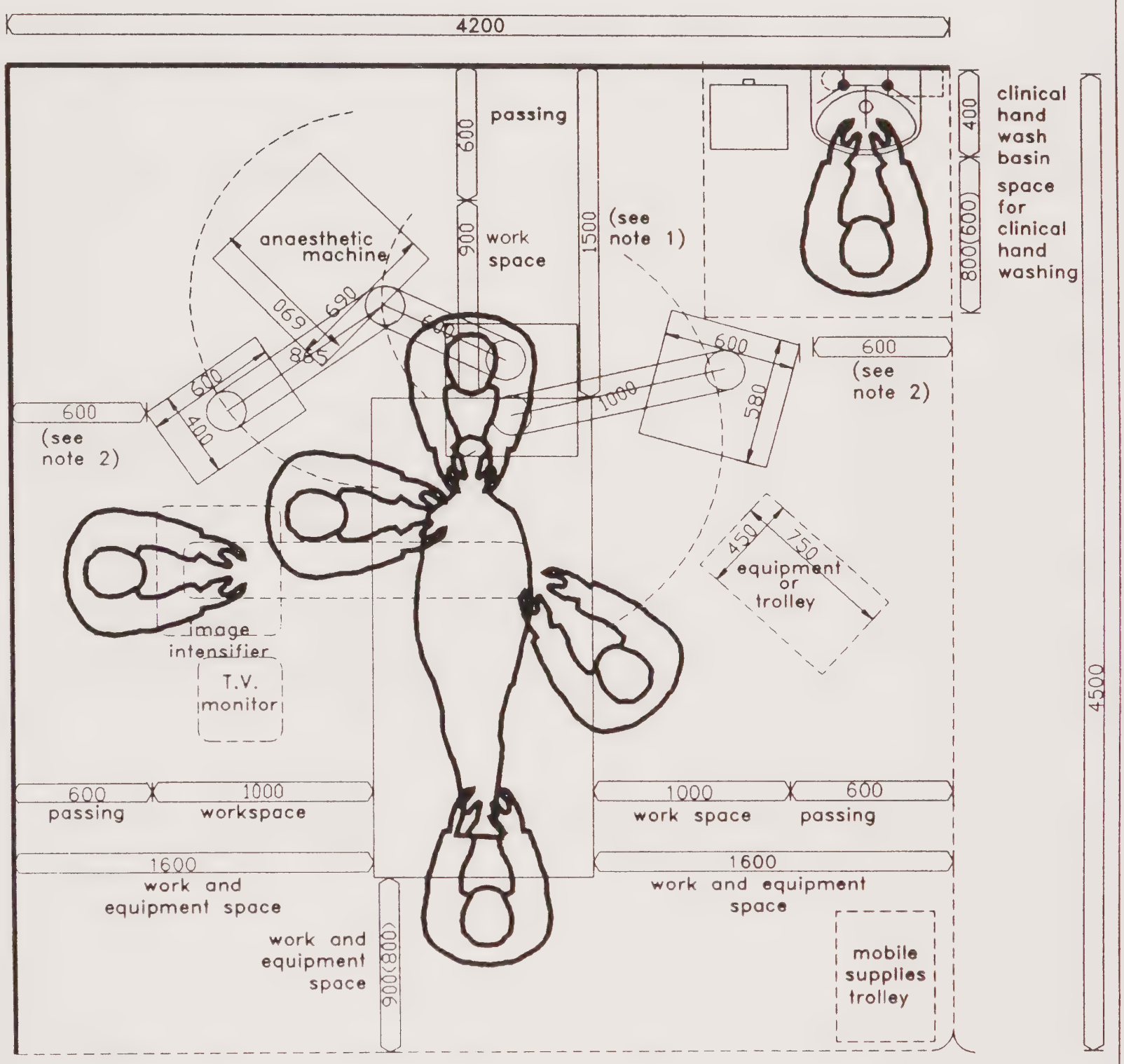
Activities
Accommodating a patient needing continuous medical and nursing care using piped medical gases, vacuum and life-support equipment.

Medical and nursing procedures require all round access to the patient

Ergonomic data sheet, not to scale

Bed space (2a)

demonstrating space requirements of a double arm double pivot point service delivery system



1500 (1400)
preferred minimum — restricted minimum (recommended only in limited circumstances see explanatory notes)

notes
1. This dimension cannot be reduced since space is required to change the position of the equipment carriers and work at the head of the patient and to park equipment
2. This space may be more depending upon the position of the arm and equipment carrier. It should never be less than 600 since access is required by staff and equipment to the patient's head

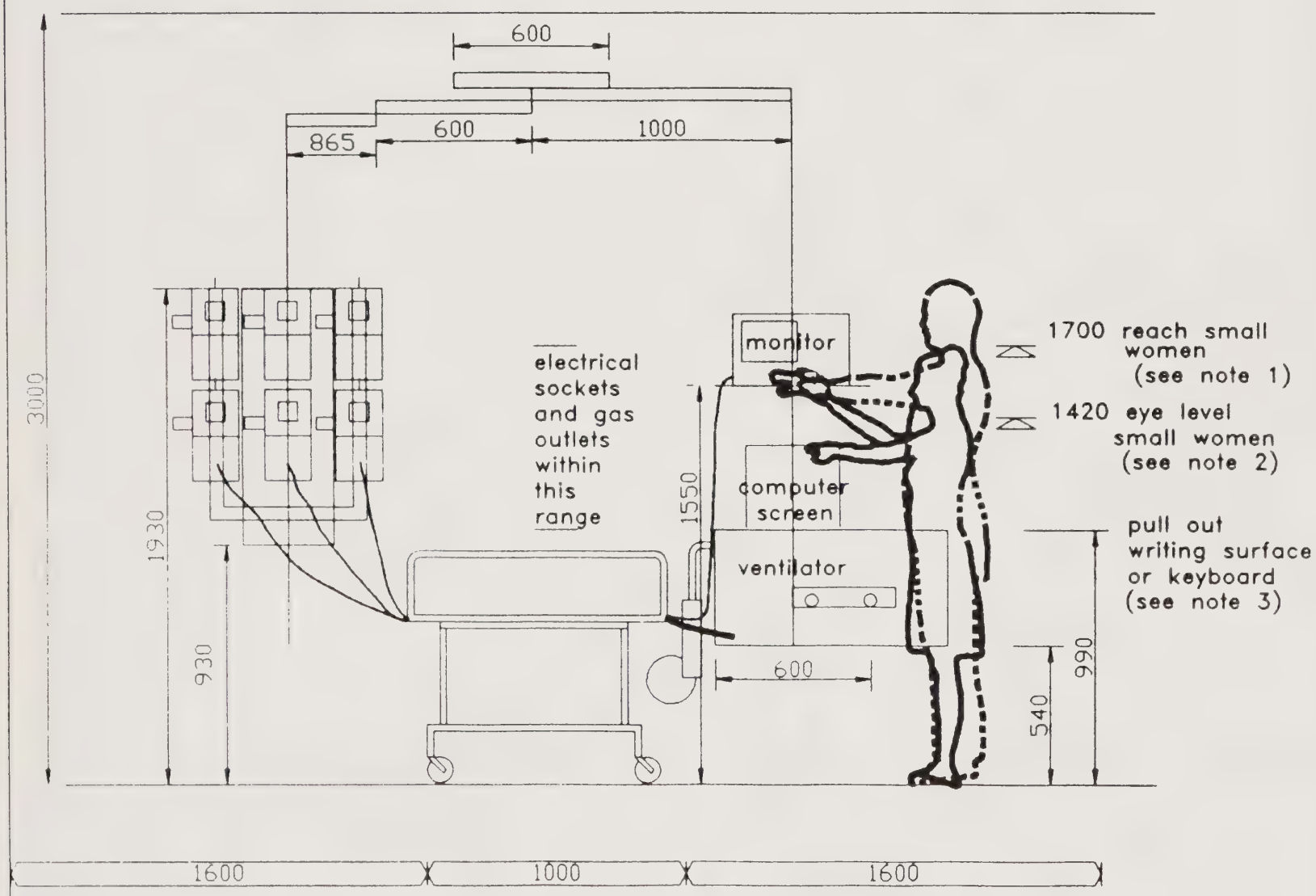
Activities
Accommodating a patient needing continuous medical and nursing care using piped medical gases, vacuum and life-support equipment.

Medical and nursing procedures require all round access to the patient

Ergonomic data sheet, not to scale

Bed space (2b)

demonstrating space requirements of a double arm double pivot point service delivery system



1500 (1400)
preferred minimum
rastricted minimum (recommended only in limited circumstances see explanatory notes)

notes
1. With this design of system all service outlets can be reached with ease and safety by all members of staff
2. The height of the monitor is satisfactory since it will not be viewed by standing directly in front of it, but from the foot of or the opposite side of the bed.
3. This height is satisfactory for occasional short duration writing notes or using the keyboard whilst standing.

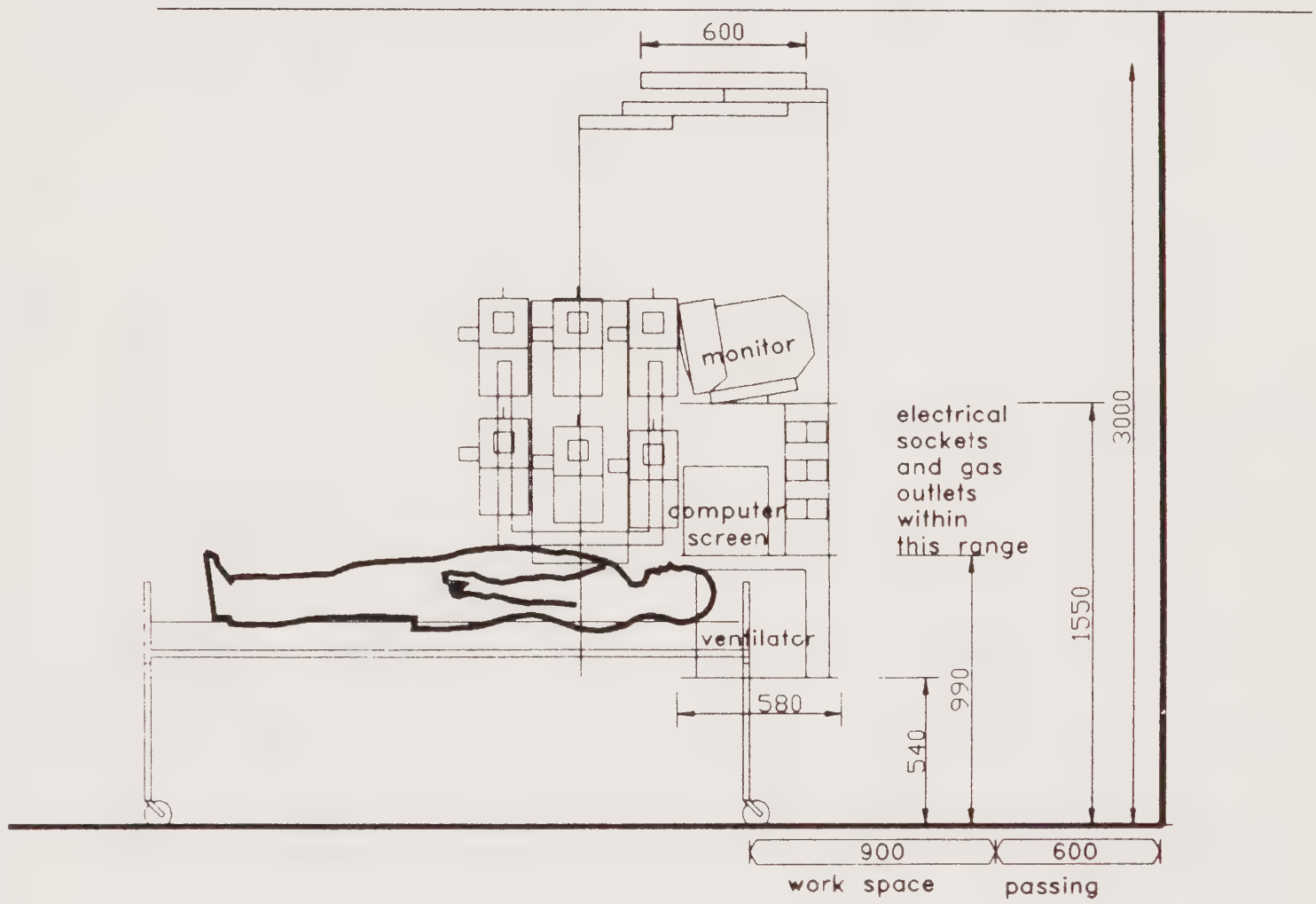
Activities
Accommodating a patient needing continuous medical and nursing care using piped medical gases, vacuum and life-support equipment.

Medical and nursing procedures require all round access to the patient

Ergonomic data sheet, not to scale

Bed space (2c)

demonstrating space requirements of a double arm double pivot point service delivery system



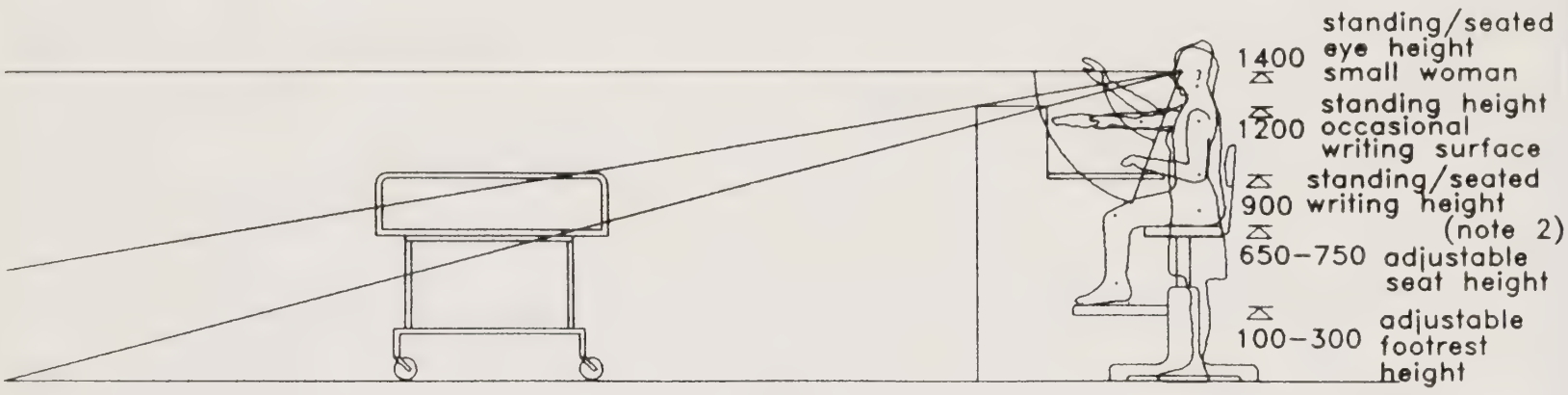
1500 (1400)
preferred minimum
restricted minimum (recommended only in limited circumstances see explanatory notes)

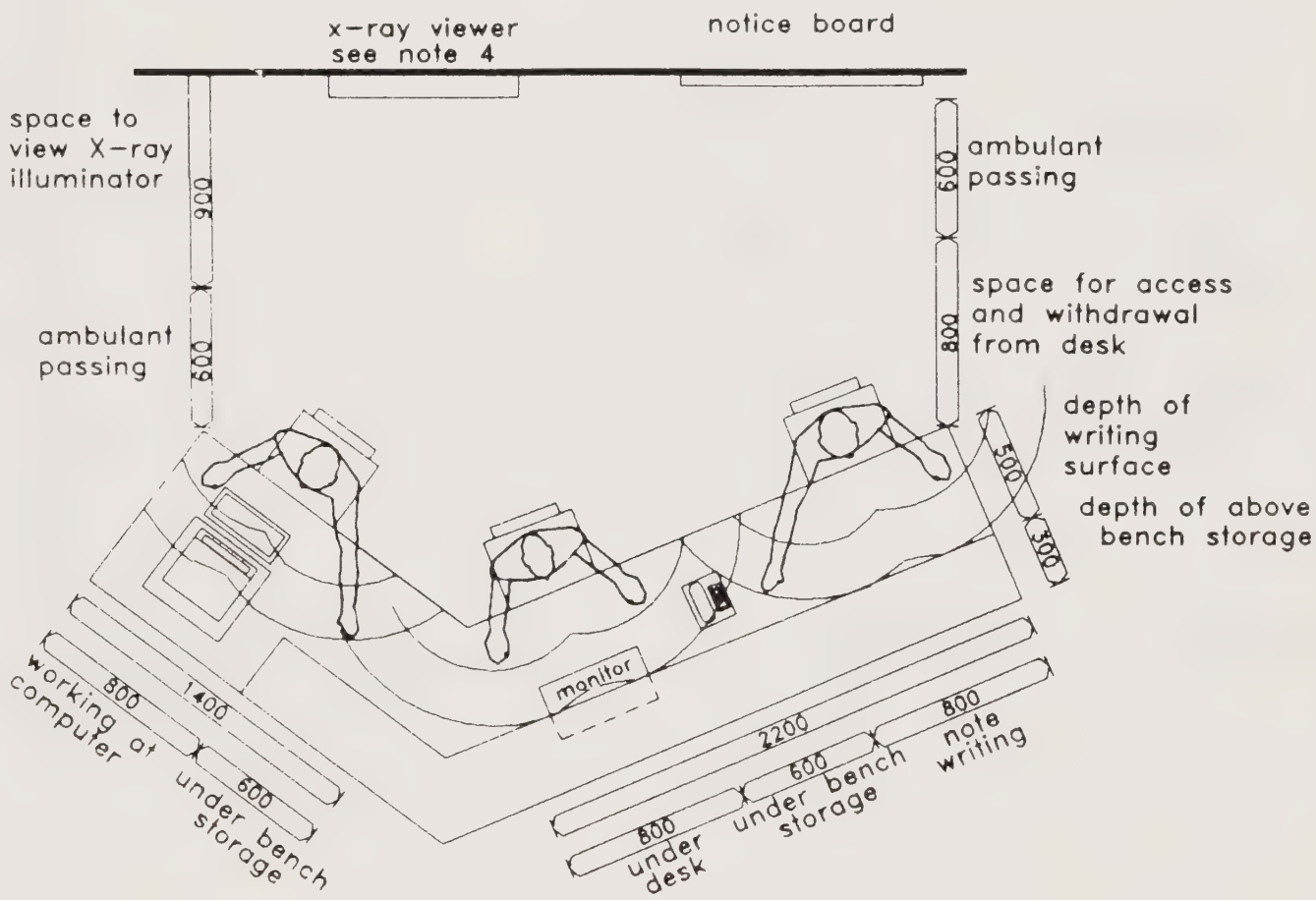
Activities

Nursing, administrative and communication centre for up to 8 beds. Activities include; observation of patients, reporting, report writing, telephoning clerical work, teaching/discussion viewing x-rays and central monitor and use of computer.

Ergonomic data sheet, not to scale

Staff Base(3)





1500 (1400)
preferred minimum — restricted minimum (recommended only in limited circumstances see explanatory notes)

notes

1. An angled design provides a more extensive view of the unit and is flexible since it can be installed at different orientations to provide the best view of the bedspaces within the overall design. (The same dimensions can be incorporated into a linear design.)

2. In order to provide a good view of the patients and bed spaces from the staff base it is recommended that the work surface height is 900, which is suitable for writing while standing. For seated tasks a draughtsman's type chair, with adjustable seat and foot rest, is essential.

The work surface should not be thicker than 20mm

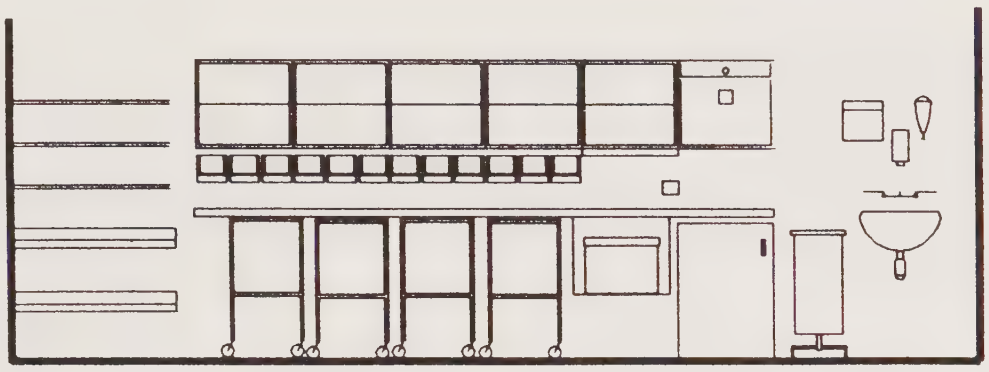
3. A between bed screen height of more than 1000 will obstruct the clear view of the unit.

4. The height of the centre of the x-ray illuminator for viewing should be 1600.

Activites
Facilities for holding and preparing clean and sterile materials used in the treatment of patients.
Safekeeping of drugs, medicines, lotions, etc.

Ergonomic data sheet not to scale

Clean Utility
(4)



1700 max reach over units, small woman
1420 eye level small woman
900 bench height
300 minimum reach

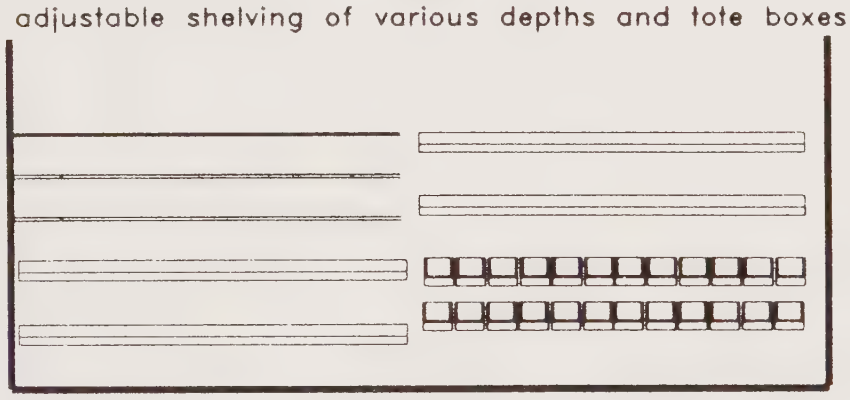
6000

3600
preparation bench

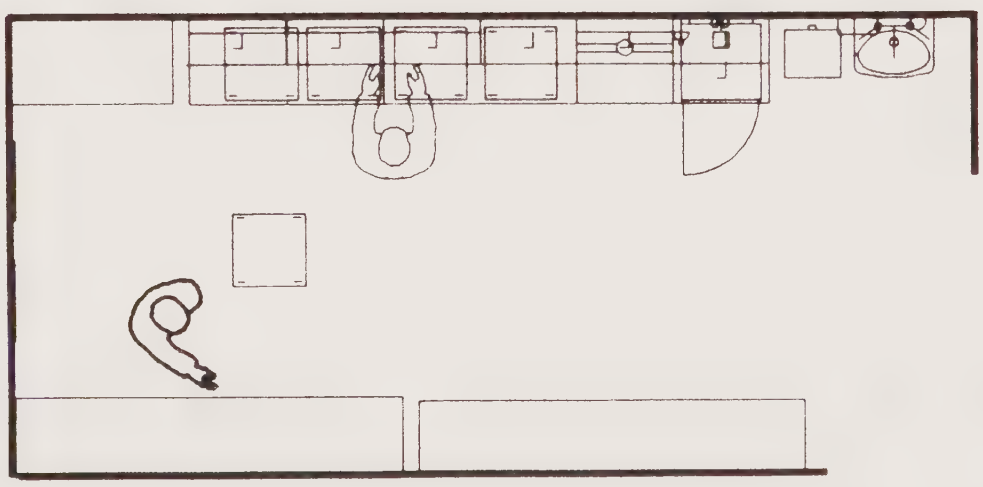
900
space for clinical handwashing

2200
space for parking 4– 450 X 450 treatment trolleys under bench

5000
adjustable shelving of various depths and tote boxes



1700 max reach over units, small woman
1420 eye level small woman
300 minimum reach



catheter racks

500 depth of units

800 space for clinical handwashing

900 kneeling or bending access to cupboards and laying up trolleys

900

depth of shelves 300 – 500

1350 *(1300)*
preferred minimum — restricted minimum (not recommended for general use (see explanatory notes)

Notes.
The facilites shown are optimum for a unit of 8 beds for a period of 4–5 days. Adjustable, open storage is preferred for flexibility and ease of finding items. Cupboards should be provided where security is required for drugs etc.

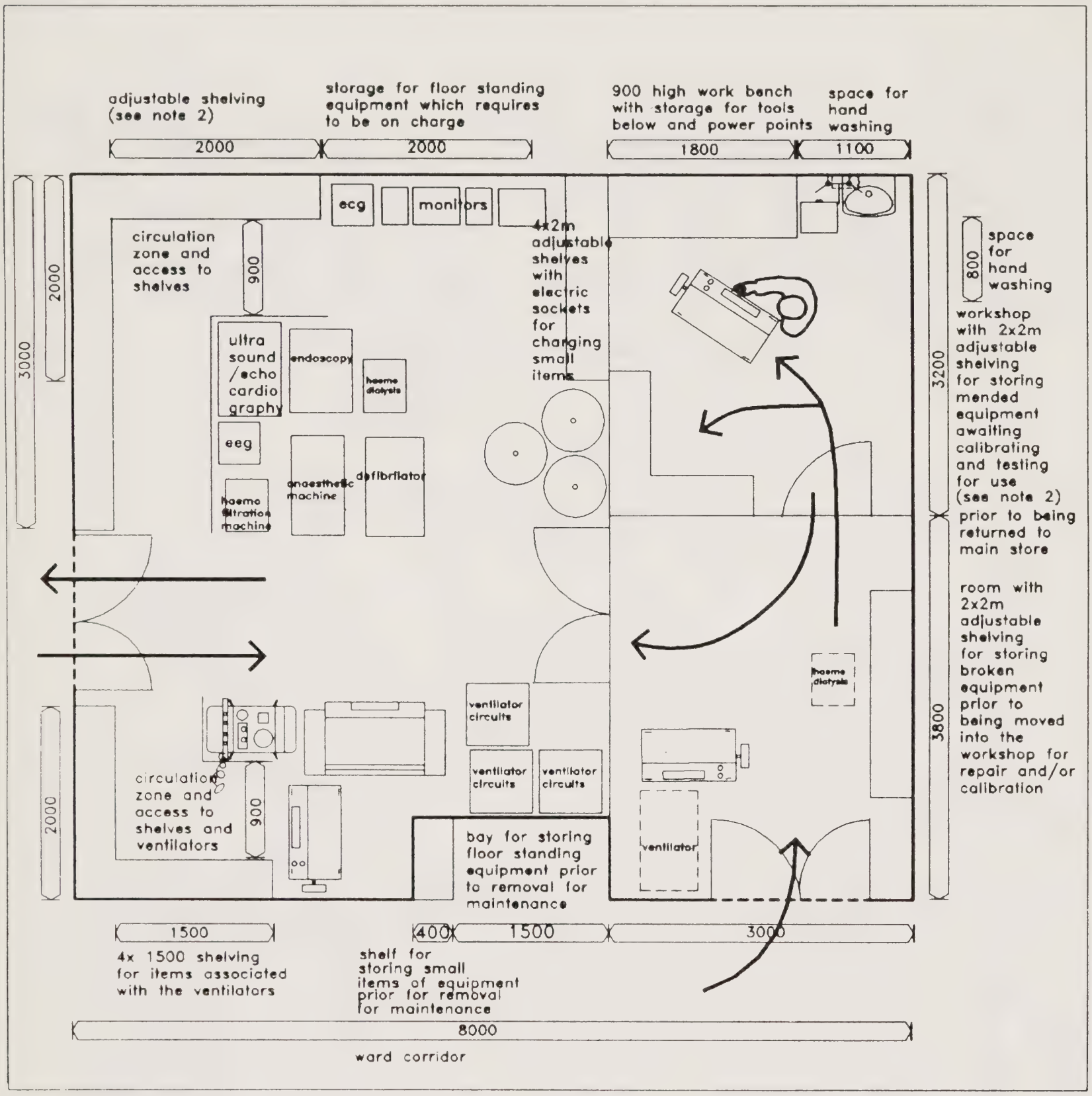
4. The Clean Utility should be adjacent to the staff base in order to ensure staff surveillance against unauthorised entry.

4. An opening without doors is preferred for ease of access and for surveillance.

Activities
Facilities for storing floor and shelf mounted equipment and for charging electrical equipment. Workshop facilites for maintaining, calibrating and testing equipment.

Ergonomic data sheet, not to scale

Clinical equipment store and workshop (5)



1350 (1300)

Preferred minimum — Restricted minimum (not recommended for general use see explanatory notes)

Notes

1. It is important that broken equipment is kept separately from that which is clean and in working order. The design should ensure that clean and serviceable equipment is physically separated from broken and contaminated equipment. Equipment awaiting maintenance will be held in a lobby until taken through to the workshop.

2. Adjustable shelving should be provided between the heights of 300 and 1300 max with intermediate shelves at approximately 600 and 1000. This is to ensure that items can be placed and retrieved easily and safely. Heavier objects should be placed at waist height.

3. Items that require charging should be grouped together. Sockets should be provided at 900 for floor standing equipment and at approximately 450, 800, and 1200 for the shelf stored items.

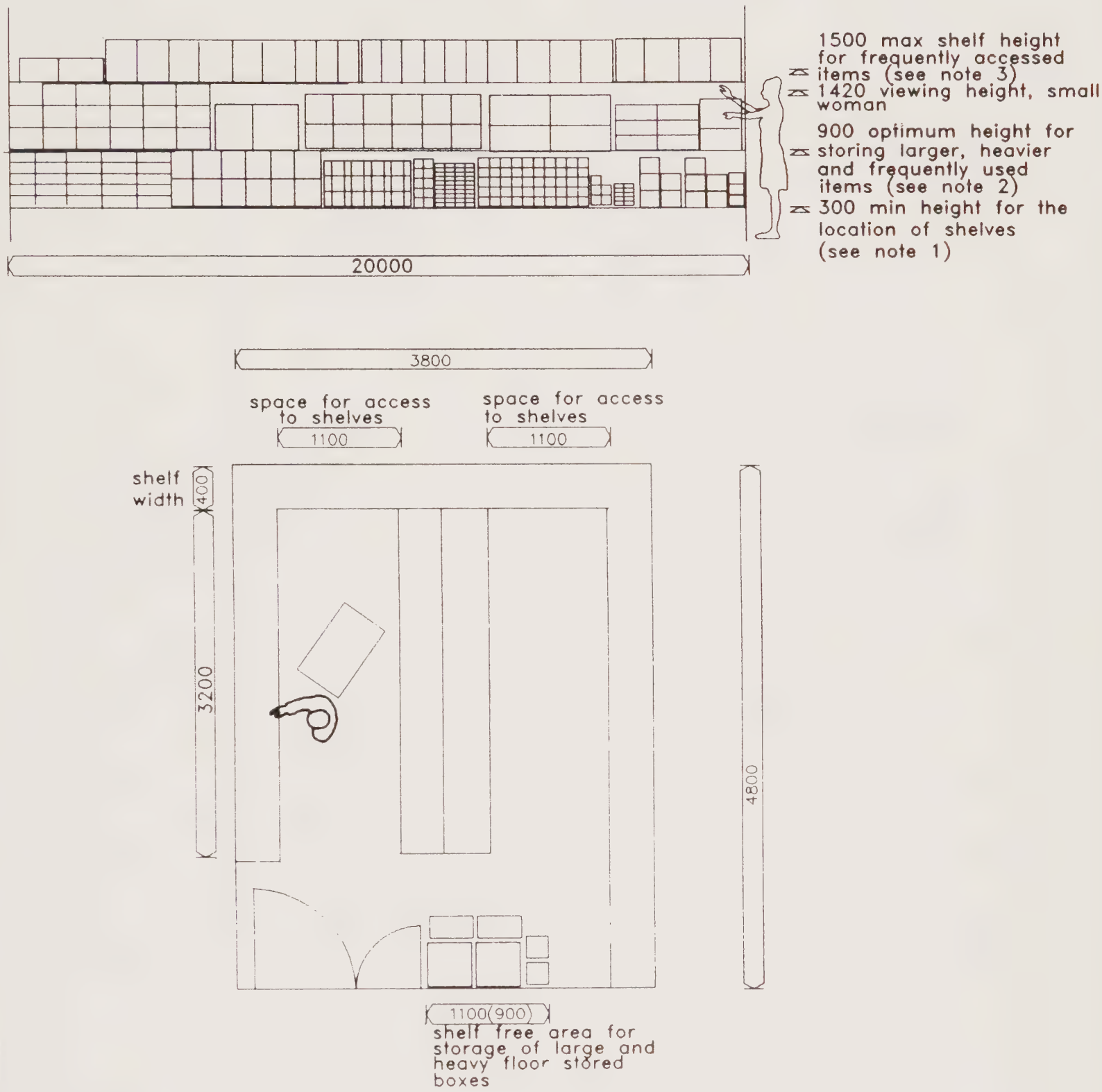
4. Clean, calibrated and tested ventilators and the associated consumables should be stored together for convenience and efficiency.

Activites

Facilites to store items that are too large to store in the Clean Utility and those that are greater than a 5 day supply. It is envisaged that a two week supply would be held here.

Ergonomic data sheet, not to scale.

Bulk Store (6)



1100(900)

Preferred minimum

Restricted minimum (not receommended for general use see explanatory notes)

Notes

1. Items should not be stored below 300. Small light items may be stored between 300 and 900 since some bending will be necessary.

2. Larger, bulkier and heavier items should be stored at approximately 900 to enable itmes to be retrieved and stored safely and easily.

3. Only light and single items should be stored above 1500 to enable them to be reached easily and safely.

4. Shelf heights are given for guidance but it is suggested that adjustable shelving is provided.

5. 1100 is required between shelf units to allow safe storage and retrieval and the manoeuvring of any trolleys.

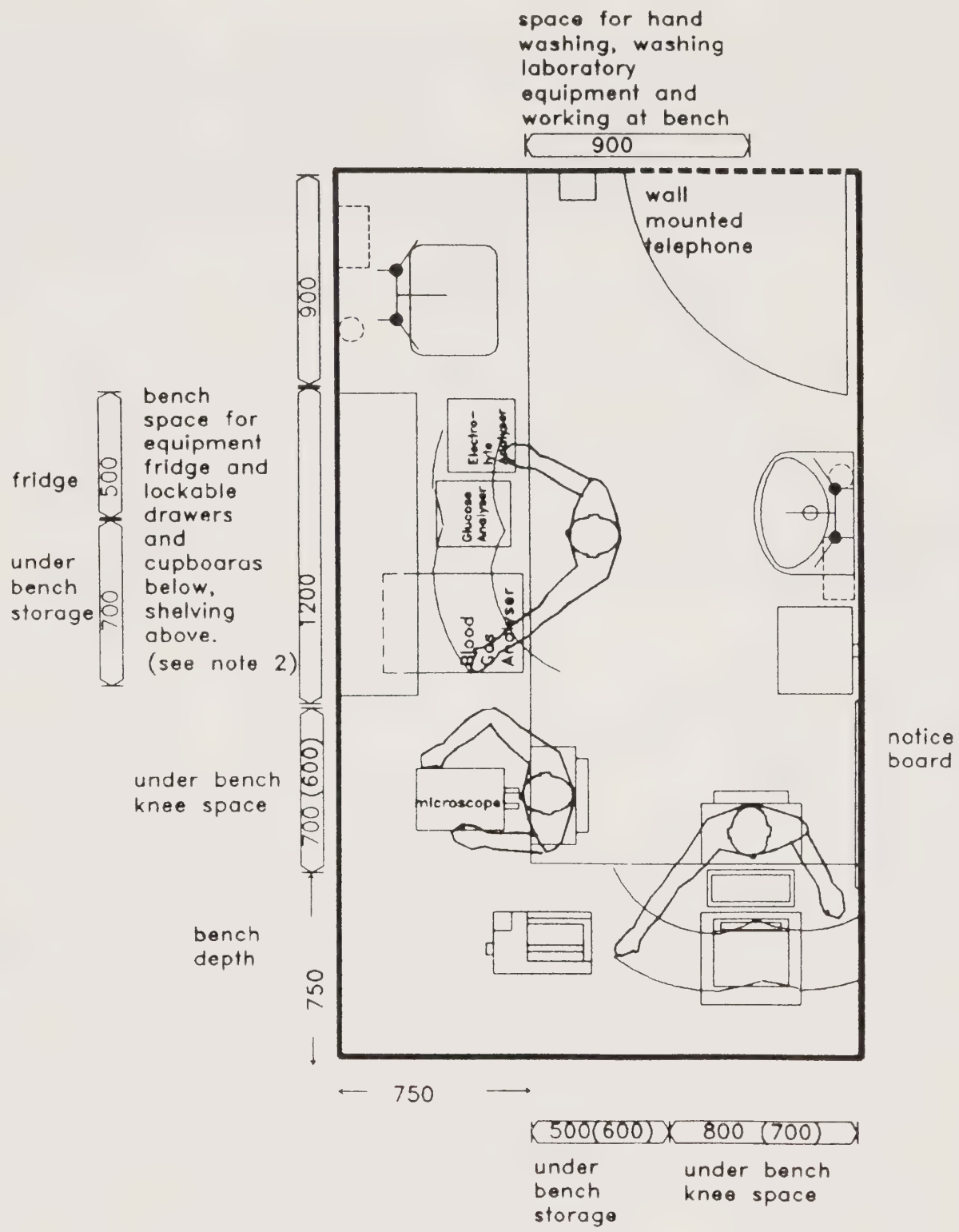
Activites
Performing analysis of blood samples using technical equipment, by up to 2 staff
Occasional use of computer.

Provision for hand washing.
Facilities for storage of reagents and containers.

Ergonomic data sheet,not to scale

Laboratory (7)

Users
up to 2 staff



1000(900)

preferred minimum
Restricted minmum (not recommended for general use: see explanatory notes)

Notes
1. The height of the bench for carrying out tasks at equipment when standing should be 900mm.
2. Maximum height for shelving over a bench is 1700mm.
3. A bench height of 900mm is satisfactory when using a computer occasionally for short periods and an adjustable draughtsmans type chair is provided.

Appendix 2

Bed space equipment and service requirements

1. Shown below is a list of items of equipment usually present in a bed space. Some items are only used intermittently. The shape, size and deployment of the equipment is for review with the ergonomist. The services required by each item are also shown.

Items of equipment

Item no.	Item
1.	Bed – Kings Fund Airfluidised Low air loss
2.	Oxygen flowmeter pipeline
3.	Suction apparatus high pressure Suction apparatus low pressure Suction wound drainage
4.	Ventilator
5.	Monitor, multiparameter temperature, blood pressure, oxygen/carbon dioxide, CVP, etc
6.	Infusion controller
7.	TPN controller
8.	Syringe pump
9.	Computer terminal
10.	Examination lamp/spot
11.	Humidifier – heated
12.	Electric fan
13.	Blood warmer
14.	Monitor blood oxygen
Intermittent use	
15.	ECG machine
16.	EEG machine
17.	X-ray mobile image intensifier
18.	Ultrasound/echocardiography
19.	Endoscopy (fibre optic light source)
20.	Defibrillator
21.	Anaesthetic machine
22.	Haemodialysis
23.	Haemofiltration

Service requirements

Type of service	Required by item no(s)	Total no. of outlets required in each bed space
Oxygen	2, 4, 21	2-3
Suction	3, 19	2
Air	4	1
Nitrous oxide and AGS (project option)	–	1
Electrical socket – outlet	1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23	20
Water	22	Designated beds only
Drainage	22	Designated beds only

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Alphabetical index

Access 3.12
Accommodation,
  schedules of
  Chapter 7
Activity Data 6.15,
  Chapter 8
Adaptation of existing
  buildings 5.6
Areas 7.7
Assisted bathroom/WC 4.52
Automatic Data Processing
  5.15

Bathroom/WC, assisted
  4.52
Bed areas 4.11
Bedside storage 4.21
Blood gas analysis 2.17
Bulk supplies store 4.32

Call systems 6.82
Capricode 1.7
Catering 2.18
Ceilings 3.36
Circulation 7.10
Clean utility 4.23
Cleaners' room 4.49
Cleaning 3.40
Clinical equipment store
  4.36
Clinical teaching 2.13
Clocks, electric 6.90
Communications 3.8, 7.11
Component data 5.14
Control,
  and isolation devices 6.14
  of infection 2.14
Controlled Drugs cupboard
  6.66
Cost allowances 1.8, 7.2

Departmental
  relationships 3.2
Dialysis 6.46
Dimensions 7.7
Dirty utility 4.24
Disabled people 5.18
Disposal, 2.22
  hold 4.29
Domestic services 2.21
Doors and frames 3.37
Drainage, internal 6.93

Economy 6.4
Electrical,
  and medical gas
  outlets 6.22
  installation 6.53
  interference 6.54
  services 6.51
Emergency electrical
  supplies 6.77
Engineering,
  commissioning 6.21
  services 6.1, 7.12
Entrance door security
  system 6.80
Entrance/waiting area 4.9
Equipment, 1.9, 7.16
  service room 4.37
Essential Complementary
  Accommodation 7.5
Exclusions 1.4

Finishes 3.29
Fire safety/precautions
  3.14, 6.17
Floors 3.30
Functional,
  relationships 4.3
  unit 2.9, 7.4
Furniture store 4.35
Future service trends 2.7

Gowning lobby 4.14

Handover 2.16
Health and safety 2.15
Heating 3.27, 6.23

Inclusions 1.3
Infection, control of 2.14
Information handling 2.37
Internal,
  drainage 6.93
  environmental
  considerations 3.19
Isolation devices 6.14

Laboratory 4.38
Layout 3.6
Lighting 3.20, 6.56
Lightning protection 6.92
Linen storage 4.33
Location 3.2

Maintenance and
  cleaning 3.40
Maximum demands 6.9
Mechanical services 6.23
Medical gases 6.22, 6.50
Mobile X-ray equipment
  bay 4.34
Model specifications 6.3
Multi-bed area 4.18

Noise 3.22, 6.19

Objectives 2.1
Observation 4.8
Office accommodation 4.47
On-call facilities 4.44
Optional Accommodation
  and Services 7.6

Pathology tests 2.17
Patients' pantry 4.43
Piped medical gases 6.50
Planning relationships 3.6
Plant and services 6.10
Purpose and objectives 2.1

Radio and television 6.91
Relatives' facilities 4.45
Reporting/handover 2.16

Safety 2.15, 6.16
Scale of provision 2.8
Schedules of
  accommodation
  Chapter 7
Security 3.12, 5.5
Seminar room 4.48
Service planning issues 2.3
Signposting 3.41
Single-bed rooms 4.14
Smoking 3.28
Socket-outlets 6.68, 6.74
Staff,
  base 4.10
  changing 2.39, 4.39
  rest room 4.41
  pantry 4.41
Statutory requirements 5.2
Storage 2.22, 4.32
Supplies, storage and
  disposal 2.22
Switchcupboard 4.50

Teaching, clinical 2.10, 4.48
Telephones, 3.6
  wiring 6.84
Television 6.91

Upgrading of existing
  buildings 5.6
User requirements 2.10

Ventilation 3.24, 6.28

Waiting area 4.9
Walls 3.34
Water services 6.43
Whole Hospital policies
  2.18
Windows 3.38
Wiring/Wireways 6.84,
  6.88
Works,
  cost 7.2
  Guidance Index 5.4

X-ray, mobile equipment
  bay 4.34

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